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Illinois Environmental Protection Agency

Southeast Rockford Source Control Operable Unit Focused Feasibility Study Volume III of III

September 5, 2000

Final

Project Number: 1681

Report

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IEPA-BOL-ESRC

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List of Appendices

Appendix

- A Risk Assessment Reports**
- B Backup for Contaminant Fate and Transport Analysis**
- C Contaminated Material Volume Calculations**
- D Detailed Cost Backup**

List of Abbreviations

Abbreviation

1,1,1-TCA	1,1,1-Trichlorethane
1,2-DCA	1,2-Dichloroethane
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	Below Ground Surface
BRA	Baseline Risk Assessment
BETX	Benzene, Ethylbenzene, Toluene, and Xylene
CAA	Clean Air Act
CDM	Camp Dresser & McKee
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cm/s	Centimeters per second
COPC	Contaminant of Potential Concern
CWA	Clean Water Act
DCA	Dichloroethane
DCE	Dichloroethene
DNAPL	Dense Non-Aqueous Phase Liquid
ERSV	Exposure Route Specific Values
ETX	Ethylbenzene, Toluene, and Xylene
FFS	Focused Feasibility Study
FOC	Fraction of Organic Carbon
GMZ	Groundwater Management Zone
gpm	Gallons per Minute
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
HSWA	Hazardous and Solid Waste Act Amendments of 1984
HWIR	Hazardous Waste Identification Rule
IDPH	Illinois Department of Public Health
IEPA	Illinois Environmental Protection Agency
IGWPA	Illinois Groundwater Protection Act
IRIS	Integrated Risk Information System
IDW	Investigation Derived Wastes
ISWS	Illinois State Water Survey
LDRs	Landfill Disposal Restrictions
LNAPL	Light Non-Aqueous Phase Liquid
kg	Kilogram
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
ug/kg	Micrograms per kilogram
ug/L	Micrograms per liter

mg	Milligram
MGD	Million Gallons per Day
mg/kg	milligram per kilogram
MSL	Mean Sea Level
MTRs	Minimum Technology Requirements
NAAQS	National Ambient Air Quality Standards
NAMS	National Air Monitoring Station
NAPL	Non-Aqueous Phase Liquid
NCLP	National Contract Laboratory Program
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethene
POTW	Publicly Owned Treatment Works
ppb	parts per billion
ppm	parts per million
PQL	Practical Quantitation Limit
PRA	Preliminary Risk Analysis
RA	Risk Assessment
RAL	Removal Action Level
RfD	Reference Dose
RBC	Risk Based Concentration
RBCA	Risk Based Corrective Action Model
RCRA	Resource Conservation and Recovery Act
RI/FFS	Remedial Investigation/Focused Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SCGV	Soil Component of Groundwater Ingestion Exposure Route Values
SCOU	Source Control Operable Unit
SCL	Source Control Leachate
SCS	Source Control Soil
SDWA	Safe Drinking Water Act
SMCL	Secondary Maximum Contaminant Level
SPLP	Synthetic Precipitation Leachate Procedure
SSL	Soil Screening Level
SVOC	Semi-Volatile Organic Compounds
TACO	Tiered Approach to Corrective Action Objectives
TBC	To Be Considered
TCA	Trichloroethane
TCE	Trichloroethylene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure

TOC	Total Organic Carbon
TSCA	Toxic Substance Control Act
UCL	Upper Confidence Limit
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound

APPENDIX C

CONTAMINATED MATERIAL VOLUME CALCULATIONS

CLIENT DEVA
 PROJECT Rockford FS
 DETAIL Area 4 - Volume Calculations

JOB NO. 05-0001
 DATE CHECKED 7/14/98
 CHECKED BY NK

COMPUTED BY AVESSELL
 DATE 7/15/98
 PAGE NO. 1-f

AREA 4

* Re-visit contaminated volume calculations based on new Tier II Soil Remediation Objectives.

* Only compound for Area 4 (RBSL atten) is for
1,1,1-Trichloroethane = 9.12 mg/kg

General Notes

+ From Phase I/II:

- Soil Gas highest @ N + N central area of Parking Lot
 - Depth to GW ~ 23 ft
 - GW contain sludge to be shallow
 - C₁ product 2 ft - 36' in SB4-6
 - Boundaries of contam. area: N/Central Parking Lot
 - W: Marshall St
 - N: SWECO Bldg
 - E: ?
 - Most highly contaminated area: 50' x 70', 5' thick = 17,500 ft³

+ From SCOU:

- GW @ ~ 29' bgs near the source
 - Subsurface soil - VOCs on 10/98 SB4-202, 27' - 35'
 - 3' - 8' also detected, detected 40-52 ppm
 - 18' bgs, 71 ppm

+ General:

- Roughly centered on SB4-202 (SCOU) + SB4-1 (Phase I/II)
- Soil gas data considered, but noted that VOC migration to unpaired areas was identified. Therefore, high SG data did not necessarily indicate source areas when coordinated w/ soil boring data.

→ Using 9.12 mg/kg (ppm) for soil rem. obj ...
 = 9120 ug/kg (ppb)

Locations of 1,1,1-TCA Exceedance

- SB-202-8 (29'-31'), 6/96 [510,000 ug/kg]
- SB4-1F (30'-32'), 6/93 [360,000 ug/kg]
- SB4-5F (30-32'), 6/93 [190,000 ug/kg]

Area 4 - Contaminated Area

Parking Lot: $(1.05'' \times 0.6'') + (0.5'' \times 0.05'') = 0.655 \text{ in}^2$
 (Scale: 1" = 80')
 = 4,200 ft² Area [Lot]

Area Beneath Bldg (In-situ): $(0.5'' \times 0.6'') = 0.3 \text{ in}^2 \rightarrow$ 1920 ft² Area [Below Bldg]

Assuming: - Water @ 29'
 - Contaminated Thickness = 25' - 37' (12 ft)
 (based on RI info analytical)

Area 4 - Contaminated Volume

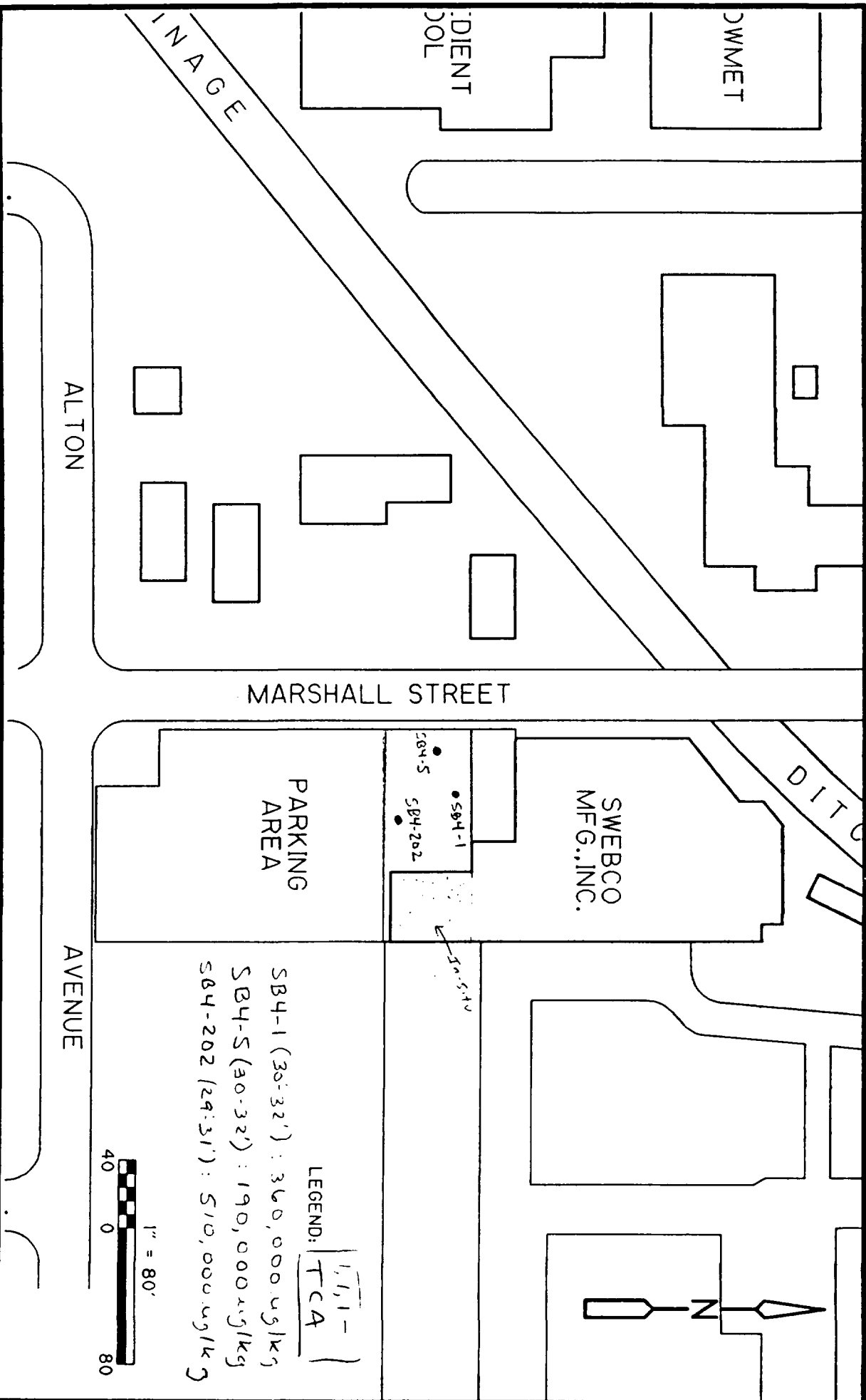
Parking Lot: $4,200 \text{ ft}^2 \times 12 \text{ ft} = 50,400 \text{ ft}^3 =$ 1870 yd³ total
 (contaminated)
 - Unsaturated (25'-29') = 625 yd³
 - Saturated (29'-37') = 1,245 yd³

Total Excavated Volume: $4,200 \text{ ft}^2 \times 37 \text{ ft} = 155,400 \text{ ft}^3$
 → 5,760 yd³ Excavated

Clean Backfill: $4,200 \text{ ft}^2 \times 25 \text{ ft} = 105,000 \text{ ft}^3$
 → 3,900 yd³ Clean Backfill

In-situ (Beneath Bldg): $1920 \text{ ft}^2 \times 12 \text{ ft} = 23,040 \text{ ft}^3$
 → 855 yd³ In-situ Vol. Contam
 - Unsaturated (25'-29') = 285 yd³
 - Saturated (29'-37') = 570 yd³

ALL VOLUME CONTAM = 2,725 yd³



SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT

AREA 4 SOIL GAS SAMPLE LOCATIONS

CDMenvironmental engineers, scientists,
planners, & management consultants

Date Sampled	6/12/96	6/12/96	6/12/96	6/27/96	6/12/96	6/12/96
Sample Number	SB4-106(S)	SB4-107(S)	SB4-107(D)	SB4-202-8	SB4-104(D)	SB4-103(S)
Depth (ft. bgs)	15-17	15-17	22-24	29-31	22-24	15-17
Organic Traffic Report Number	EBGB2	EBGB4	EBGB5	EBGR3	EBGA9	EBGA5

Volatile Organics (ug/Kg)

Chloromethane	11 U	13 U	13 U	27000 U	10 U	10 U
Bromomethane	11 U	13 U	13 U	27000 U	10 U	10 U
Vinyl Chloride	11 U	13 U	13 U	27000 U	10 U	10 U
Chloroethane	11 U	13 U	13 U	27000 U	10 U	10 U
Methylene Chloride	11 JBU	13 JBU	16 BU	27000 BJU	10 JBU	12 BU
Acetone	17 BU	13 JBU	13 JBU	27000 U	10 JBU	10 JBU
Carbon Disulfide	11 U	13 U	13 U	27000 U	10 U	10 U
1,1-Dichloroethene	11 U	13 U	13 U	27000 UJ	10 U	10 U
1,1-Dichloroethane	11 U	13 U	13 U	27000 U	10 U	10 U
1,2-Dichloroethene (total)	11 U	13 U	13 U	27000 U	10 U	10 U
Chloroform	11 U	13 U	13 U	27000 U	10 U	10 U
1,2-Dichloroethane	11 U	13 U	13 U	27000 U	10 U	10 U
2-Butanone	11 U	13 U	13 U	27000 U	10 U	10 U
1,1,1-Trichloroethane	11 U	13 U	13 U	510000 U	10 U	10 U
Carbon Tetrachloride	11 U	13 U	13 U	27000 U	10 U	10 U
Bromodichloromethane	11 U	13 U	13 U	27000 U	10 U	10 U
1,2-Dichloropropane	11 U	13 U	13 U	27000 U	10 U	10 U
cis-1,3-Dichloropropene	11 U	13 U	13 U	27000 U	10 U	10 U
Trichloroethene	11 U	13 U	13 U	27000 U	10 U	10 U
Dibromochloromethane	11 U	13 U	13 U	27000 U	10 U	10 U
1,1,2-Trichloroethane	11 U	13 U	13 U	27000 U	10 U	10 U
Benzene	11 U	13 U	13 U	27000 U	10 U	10 U
trans-1,3-Dichloropropene	11 U	13 U	13 U	27000 U	10 U	10 U
Bromoform	11 U	13 U	13 U	27000 U	10 U	10 U
4-Methyl-2-Pentanone	11 U	13 U	13 U	27000 U	10 U	10 U
2-Hexanone	11 U	13 U	13 U	27000 U	10 U	10 U
Tetrachloroethene	11 U	13 U	13 U	27000 U	10 U	10 U
1,1,2,2-Tetrachloroethane	11 U	13 U	13 U	27000 U	10 U	10 U
Toluene	11 U	13 U	13 U	27000 U	10 U	10 U
Chlorobenzene	11 U	13 U	13 U	27000 UJ	10 U	10 U
Ethylbenzene	11 U	13 U	13 U	27000 U	10 U	10 U
Styrene	11 U	13 U	13 U	27000 U	10 U	10 U
Xylene	11 U	13 U	13 U	27000 U	10 U	10 U

VOC-SB-4

Date Sampled	6/28/93	6/29/93	6/29/93	6/29/93	6/29/93
Sample Number	SB4-1F	SB4-2A	SB4-2D	SB4-3E	SB4-3E(D)
Depth (ft. bgs)	30-32	5-7	20-22	25-27	25-27
Organic Traffic Report Number	EXR36	EXR37	EXR38	EXR39	EXR40

Volatile Organics (ug/Kg)

	CA	CA	CA	CA	CA
Chloromethane	28000 U	11 U	10 U	10 U	10 U
Bromomethane	28000 U	11 U	10 U	10 U	10 U
Vinyl Chloride	28000 U	11 U	10 U	10 U	10 U
Chloroethane	28000 U	11 U	10 U	10 U	10 U
Methylene Chloride	28000 U	11 U	10 U	10 U	10 U
Acetone	28000 U	11 U	5 J	7 J	6 J
Carbon Disulfide	28000 U	11 U	10 U	10 U	10 U
1,1-Dichloroethene	28000 U	11 U	10 U	10 U	10 U
1,1-Dichloroethane	28000 U	11 U	10 U	10 U	10 U
1,2-Dichloroethene (total)	28000 U	11 U	10 U	10 U	10 U
Chloroform	28000 U	11 U	10 U	10 U	10 U
1,2-Dichloroethane	28000 U	11 U	10 U	10 U	10 U
2-Butanone	28000 U	11 U	10 U	10 U	10 U
1,1,1-Trichloroethane	360000 U	11 U	5 J	10 U	10 U
Carbon Tetrachloride	28000 U	11 U	10 U	10 U	10 U
Bromodichloromethane	28000 U	11 U	10 U	10 U	10 U
1,2-Dichloropropane	28000 U	11 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	28000 U	11 U	10 U	10 U	10 U
Trichloroethene	28000 U	11 U	10 U	10 U	10 U
Dibromochloromethane	28000 U	11 U	10 U	10 U	10 U
1,1,2-Trichloroethane	28000 U	11 U	10 U	10 U	10 U
Benzene	28000 U	11 U	10 U	2 J	10 U
trans-1,3-Dichloropropene	28000 U	11 U	10 U	10 U	10 U
Bromoform	28000 U	11 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	28000 U	11 U	10 U	10 U	10 U
2-Hexanone	28000 U	11 U	10 U	10 U	10 U
Tetrachloroethene	28000 U	11 U	10 U	1 J	10 U
1,1,2,2-Tetrachloroethane	28000 U	11 U	10 U	10 U	10 U
Toluene	28000 U	11 U	10 U	41	26
Chlorobenzene	28000 U	11 U	10 U	2 J	2 J
Ethylbenzene	28000 U	11 U	10 U	10 U	10 U
Styrene	28000 U	11 U	10 U	10 U	10 U
Xylene	28000 U	11 U	10 U	10 U	10 U

Date Sampled	6/29/93	6/29/93	6/29/93
Sample Number	SB4-4E	SB4-5E	SB4-5F
Depth (ft. bgs)	25-27	25-27	30-32
Organic Traffic Report Number	EXR41	EXR42	EXR43

Volatile Organics (ug/Kg)

	CA	CA	CA
Chloromethane	10 U	10 U	14000 U
Bromomethane	10 U	10 U	14000 U
Vinyl Chloride	10 U	10 U	14000 U
Chloroethane	10 U	10 U	14000 U
Methylene Chloride	10 U	10 U	14000 U
Acetone	10 U	9 J	14000 U
Carbon Disulfide	10 U	10 U	14000 U
1,1-Dichloroethene	10 U	10 U	14000 U
1,1-Dichloroethane	10 U	10 U	14000 U
1,2-Dichloroethene (total)	10 U	10 U	14000 U
Chloroform	10 U	10 U	14000 U
1,2-Dichloroethane	10 U	10 U	14000 U
2-Butanone	10 U	10 U	14000 U
1,1,1-Trichloroethane	9 J	6 J	190000 U
Carbon Tetrachloride	10 U	10 U	14000 U
Bromodichloromethane	10 U	10 U	14000 U
1,2-Dichloropropane	10 U	10 U	14000 U
cis-1,3-Dichloropropene	10 U	10 U	14000 U
Trichloroethene	10 U	10 U	14000 U
Dibromochloromethane	10 U	10 U	14000 U
1,1,2-Trichloroethane	10 U	10 U	14000 U
Benzene	10 U	10 U	14000 U
trans-1,3-Dichloropropene	10 U	10 U	14000 U
Bromoform	10 U	10 U	14000 U
4-Methyl-2-Pentanone	10 U	10 U	14000 U
2-Hexanone	10 U	10 U	14000 U
Tetrachloroethene	10 U	10 U	14000 U
1,1,2,2-Tetrachloroethane	10 U	10 U	14000 U
Toluene	2 J	12	14000 U
Chlorobenzene	2 J	10 U	14000 U
Ethylbenzene	10 U	10 U	14000 U
Styrene	10 U	10 U	14000 U
Xylene	10 U	10 U	14000 U

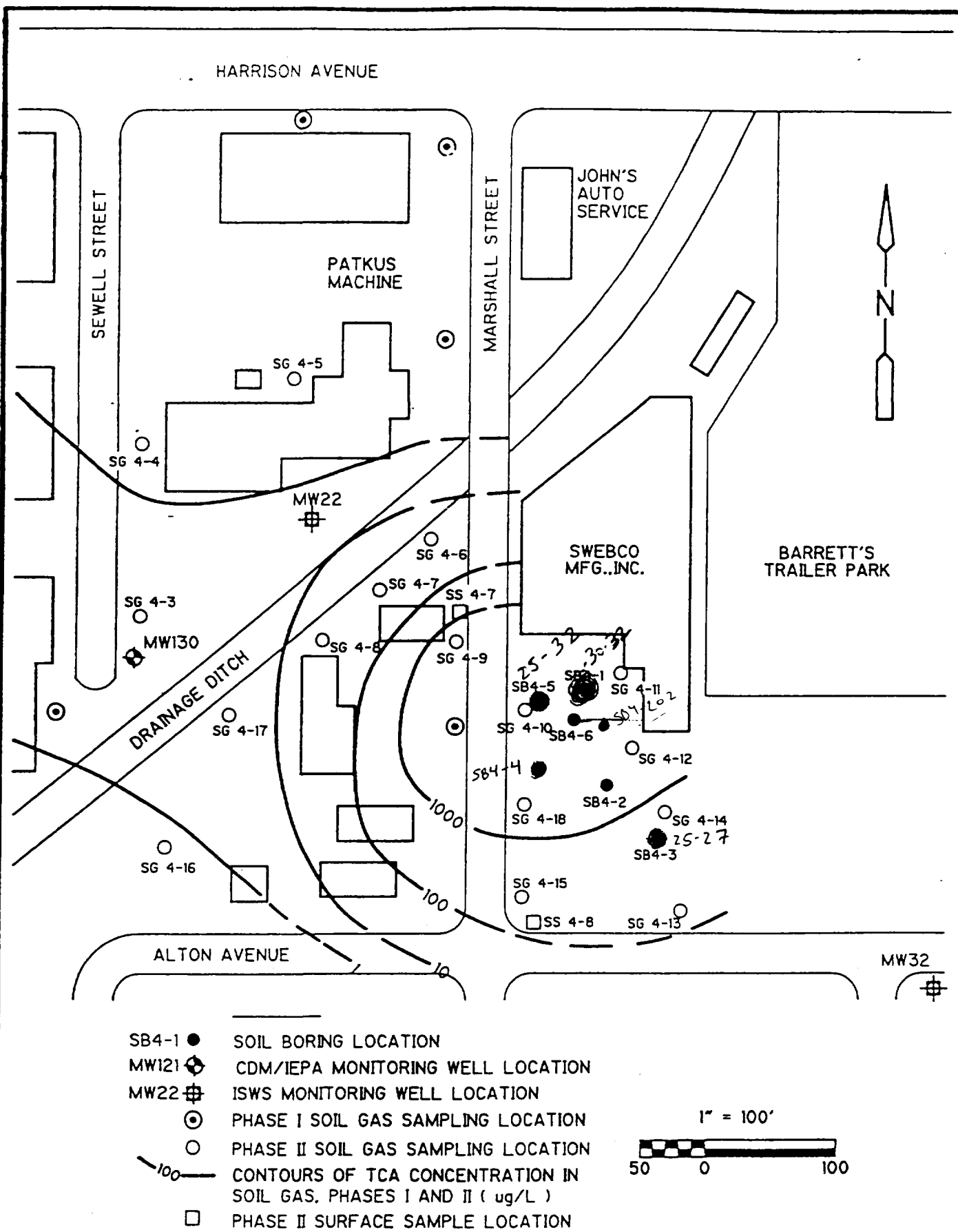
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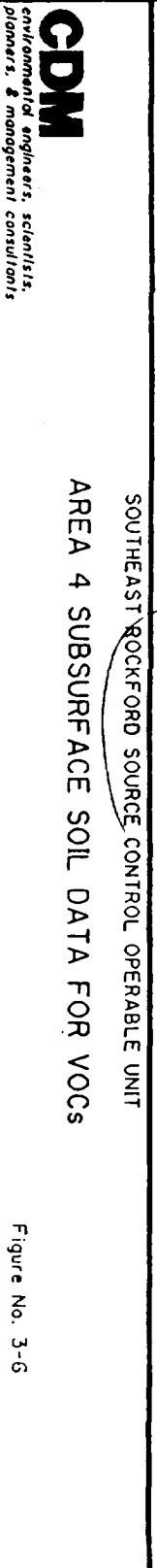
SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION STUDY

POTENTIAL SOURCE AREA 4 SOIL GAS, SURFACE SOIL SAMPLE
AND SUBSURFACE SOIL BORING LOCATIONS

CDM

environmental engineers, scientists,
planners, & management consultants

Figure No. 4-12



Area 7 - Revised Contaminated Soil Remed. Obj.

* Note: Area 7p - Northern portion of Area 7

Area 7d - Southern portion of Area 7

Applicable Tier II Soil Contamination Objectives (Regulation)

Compound	Area 7p		Area 7d	
	mg/kg (ppm)	ug/kg (ppb)	mg/kg (ppm)	ug/kg (ppb)
1,2-Dichloroethane [1]	3.68	3680 (N)	1,790	1,790,000 (N)
cis-1,2-Dichloroethane [2]	0.941	941 (1)	116	11,600 (2)
Ethylbenzene [1065]	57.3	57,300 (N)	953	953,000 (N)
Methylene Chloride [New]	1,150,000	1.15×10^9 (N)	2.27×10^{12}	2.27×10^{15} (N)
Tetrachloroethene [1306]	1.46	1,460 (5)	136	136,000 (1)
Toluene [808]	3.38×10^5	3.38×10^8 (N)	3.74×10^{14}	3.74×10^{17} (N)
1,1,1-Trichloroethane [134]	108	108,000 (2)	19,600	19,600,000 (N)
1,1,2-Trichloroethane [2]	0.619	619 (N)	56.3	56,300 (N)
Trichloroethene [4]	0.310	310 (4)	7.22	7,220 (3)
Xylenes [11435]	4,100	$4,100,000$ (N)	1.66×10^7	1.66×10^{10} (N)

(N) = No exceedances

(#) = # of exceedances

[#] = Former Tier II # in ppb

→ Revised Area 7 Contaminated (Exceeding Tier II) Areas and Volumes.

Sample Locations (Soil Borings) Exceeding Tier II (7/93)

SB7-24 (4'-6')	Area 7p
SB7-201 (25'-27')	
SB7-202 (11'-13')	
SB-134 (9'-11')	
SB7-4 (20'-22')	
SB7-7 (25'-27')	Area 7d
SB7-8 (15'-17')	
SB7-9 (20'-22')	
SB7-10 (5'-7')	

Map Location (as marked)	Planimeter Reading (Avg of 3)	Actual Area (ft ²) (x225)	Contam Thickness (ft Dgs) (ft)	Water Level (ft bgs)	<wl Unsaturated Volume (ft ³)	>wl Saturated Volume (ft ³)	Clean Backfill (ft ³)
A	$\left. \begin{matrix} 52 \\ 50 \\ 48 \end{matrix} \right\} 50$	11,250	4'-28' (24')	20'	(4-20) 180,000	(20-25) 90,000	45,000
B	$\left. \begin{matrix} 117 \\ 110 \\ 114 \end{matrix} \right\} 114$	25,650	4'-28' (24')	15'	(4-15) 282,150	(15-23) 333,450	102,600
C	$\left. \begin{matrix} 23 \\ 18 \end{matrix} \right\} 20$	2,250	19'-23' (4')	15'	0	(19-23) 9,000	42,750
D	$\left. \begin{matrix} 20 \\ 20 \end{matrix} \right\} 20$	2,250	19'-23' (4')	10'	0	(19-23) 9,000	42,750
E	$\left. \begin{matrix} 96 \\ 100 \\ 94 \end{matrix} \right\} 97$	21,825	3'-28' (20')	10'	(3-10) 152,775	(10-23) 392,850	65,475
F	$\left. \begin{matrix} 16 \\ 16 \\ 15 \end{matrix} \right\} 16$	3,600	3'-28' (20')	5'	(3-5) 7,200	(5-23) 92,800	10,800
							309,375 ft ³

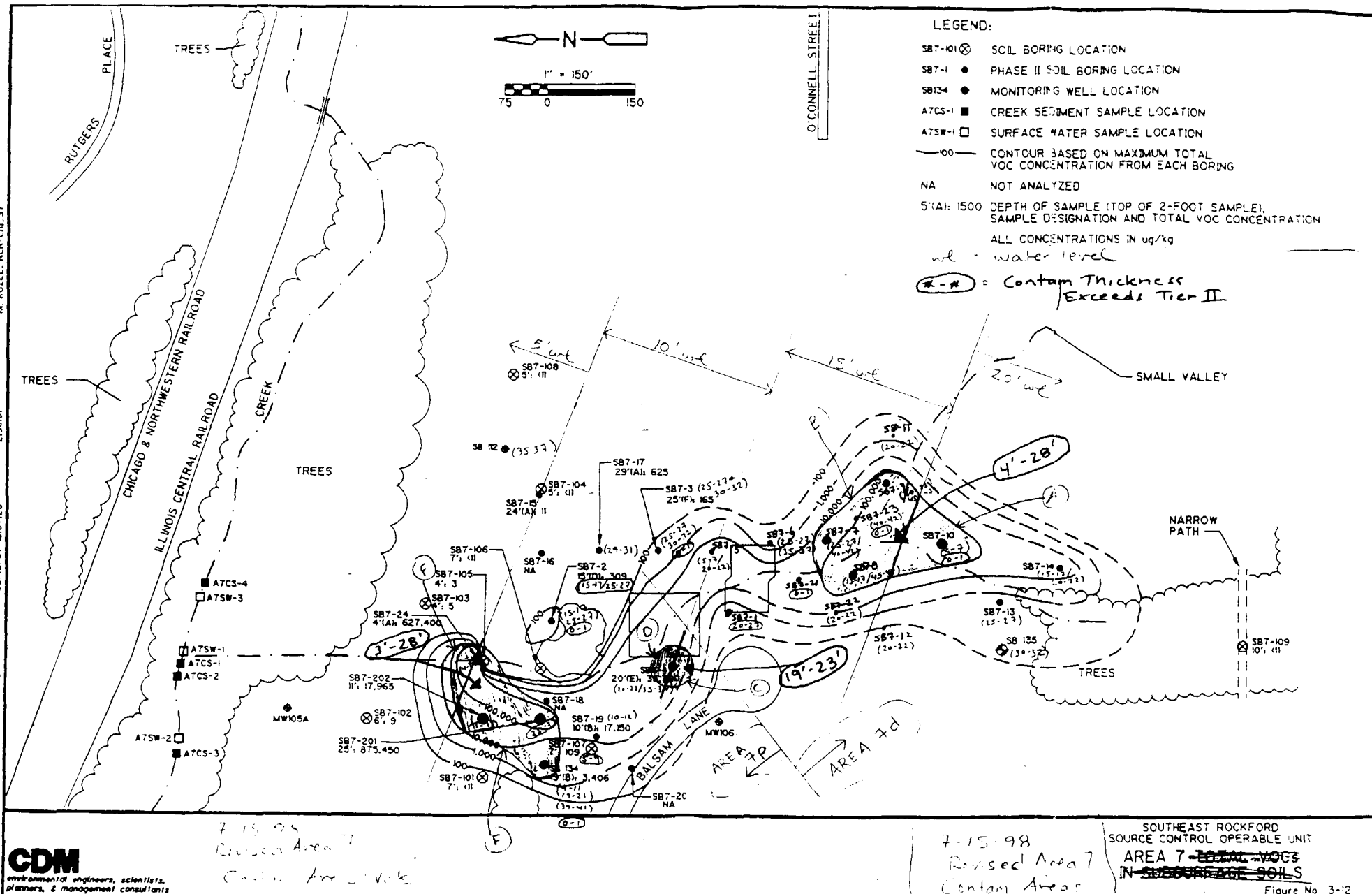
Total Unsaturated Volume: $622,125 \text{ ft}^3 = 23,042 \text{ yd}^3$

Total Saturated Volume: $917,100 \text{ ft}^3 = 33,967 \text{ yd}^3$

Total Contaminated Volume: 57,009 yd³

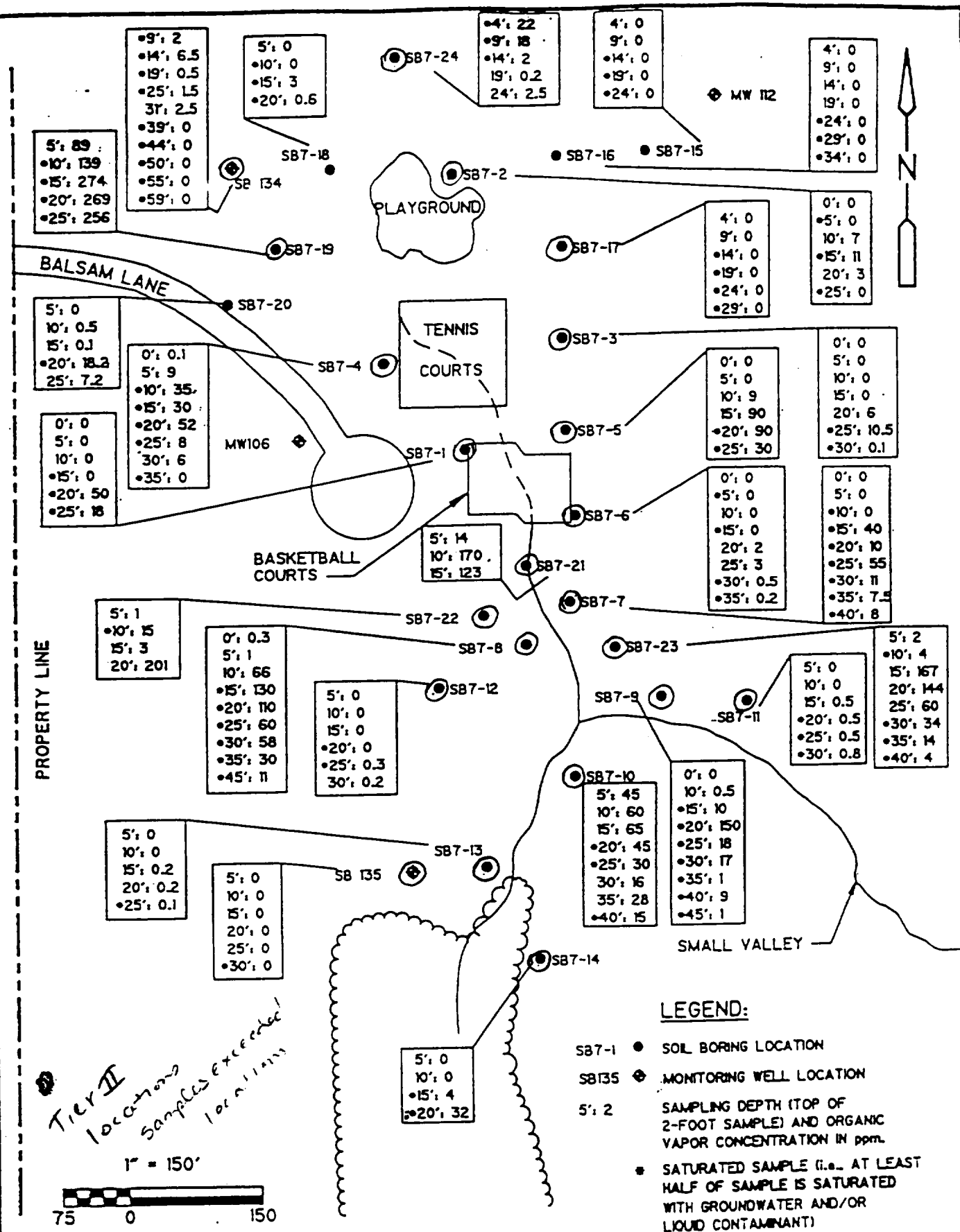
Total Clean Backfill: 114,59 yd³

Total Excavated Volume: 68,469 yd³



CLIENT IEPA
PROJECT Section F1
DETAIL Area 7 Rev. Vol.JOB NO. 68-235-01
DATE CHECKED 7/15/98
CHECKED BY AVCOMPUTED BY A Vessell
DATE 7-15-98
PAGE NO. 2Assumptions for Determining Area/Volumes:

- See Fig 3-2 Markup titled "7-15-98 Revised Area 7 Contam. Area". Contamination area extent boundary was determined as 1/2 way to next non-exceeding sample location or ~35 ft radially, (whichever was less).
- Depth of exceedance was initially based on the 2 ft interval which exceeded Tier II Goals from the analytical data. Screening (OVM) data was then reviewed to determine if contamination thickness should be extended. In general, depth ranges w/ OVM data of 50+ ppm were included (dependent on the bearing screening data).
- Water Levels based on both 1993 + 1996 Regional Investigation Findings (Phase I/II + SCOU)



SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION STUDY
 ORGANIC VAPORS IN SUBSURFACE SOILS
 FIELD HEAD-SPACE CONCENTRATIONS, ppm
 POTENTIAL SOURCE AREA 7

CDM

environmental engineers, scientists,
 planners, & management consultants

Figure No. 4-13

Area 7/10 Area Volume Lakes

Based on new (7/92) Tier II guide,
there is no ^{GPM} analytical data that
shows any exceedances through
Area 7/10 (e.g. Drum Storage Area,
Loading Dock, etc.).

There are no ~~data~~ data that exceed the
Methylene Chloride guide (from 7/10,
7/10 or 7/10/92). For Area 7/10 (Drum
Storage Area), there is some 1971 EPA
data that indicates PCB is exceeded
in the ~~area~~ area, for the volume by measured
concentrations is exceeded. No EPA
analytical data @ 7/10 is available,
apparently due to restricted access.

∴ The Drum Storage area should
probably be retained at least.
Sue/Carole should make the call
on the Loading Dock (in Tier II exceed.)

Make up original calculations based
on decisions.

C. F. Miller

Area 9/10 Volume Calcs (Soil)

- Probable source areas include:
 - 1) Outside Storage Area (SE Corner 9th + 23rd)
 - 2) Loading Dock - Sundstrand
 (See shaded areas on fig.)
- For now, no volume will be calculated - other means (e.g. remedial in situ or sparging) will be further investigated. Access of these areas is questionable.

1) Drum Storage area PCE etc.

Contam Thickness 0-15 ft (Based on EPA data)

$$\text{Area} = 0.35' \times 0.6' = 0.210 \text{ in}^2 \times (200 \text{ ft/in})^2 = \underline{8,400 \text{ ft}^2}$$

$$\begin{aligned} \text{Volume of Contaminated Material} &= 126,000 \text{ ft}^3 \\ &= 4,667 \text{ yd}^3 \\ &\quad (\text{all unsaturated}) \end{aligned}$$

2) Loading Dock Area (PCE)

Contaminated Thickness 6'-15' PCE Assume 0-15' at

$$\text{Area} = 0.7' \times 0.6' = 0.42 \text{ in}^2 \times (200 \text{ ft/in})^2 = \underline{16,800 \text{ ft}^2}$$

$$\begin{aligned} \text{Volume of Contaminated Material} &= 252,000 \text{ ft}^3 \\ &= 9334 \text{ yd}^3 \\ &\quad (\text{all unsaturated}) \end{aligned}$$

3) ~~Midstates Industrial (Shallow 15' pool in)~~

~~Contam thickness 0-5 ft (Drum Storage area SW corner etc.)~~

~~$$\text{Area} = 0.4' \times 0.15' = 0.06 \text{ in}^2 \times (200 \text{ ft/in})^2 = \underline{2,400 \text{ ft}^2}$$~~

~~$$\begin{aligned} \text{Volume of Contaminated Material} &= 12,000 \text{ ft}^3 \\ &= 445 \text{ yd}^3 \\ &\quad (\text{all unsaturated}) \end{aligned}$$~~

Drops out
according to
SNE Bhagat
5-14-98
(see next page)

Total Area 9/10 : Area $\underline{25,200 \text{ ft}^2}$

Volume $\underline{14,000 \text{ yd}^3} \quad (378,000 \text{ ft}^3)$

Area 9/101

Sue - 4/20/98 9:30 AM

① Mid-States vs. Drum Storage vs. Loading Dock

#① A couple borings at depth (CDM) other data more shallow
(15-20') SB (top 10')
(23') SG TCE

• Treat mid-States as a shallow TCE problem

② Drum Storage Area

→ Top 10-15' - data on PCE, use that for dimensions

③ Loading Dock:

- bunch of USTs just S. of loading dock area (see -1 yf
Sue sent)

AREA IIGeneral Notes:

+ From Phase II:

- ↳ • Not much soil gas data, access limited in
(only SW - Villa de Roma parking lot)
- Subsurface soil, reports of elevated petroleum related compounds and other volatile VOCs in soil + GW.
 - Contamin. Western - Eastern VOCs w/ Tol., EthB, Xyl
 - Water @ ~30'
 - Include thickness for screening reading @ 250ppm
 - Typical contamin. thickness ~ 24" (see pg 3-24/50)

+ From SCOU:

- ↳ • Contamin. primarily aromatic (Xyl, Tol., EthB) w/ elevated chlorinated VOCs in GW + soils
- Checked high soil gas vs. high subsurf soil, retain areas w/ high VOCs confirmed by subsurf soil
 - Identified 3 main areas of contamin. w/ high VOCs
 - No indication of GW level or depth, above
 - Primary Contam = TEX for these areas

(See cont. pgs for Tier II Soil Remediation Goals + corresponding contaminated areas + Volumes)

Tier II Soil Remediation Objectives - RBSL at Area II

Compound	Tier II SRO's	
	mg/kg (ppm)	mg/kg (ppb)
Benzene	0.189	189 (1)
Ethylbenzene	7,89 4.16	7,890 4,160 (6)
Methylene Chloride	47,900,000	47,900,000,000 (0)
2-Methylphenol	2.82×10^{23}	2.82×10^{26} (0)
Toluene	1.06×10^{10}	1.06×10^{13} (0)
Trichloroethene	0.0507	50.7 (1)
Xylenes (total)	24,500	24,500,000 (0)

(#) = # of sample loc. exceeding Tier II

Area II Subsurface Sample - exceeding Tier II

1993	SB11-1G (35'-37')	[56,000 mg/kg EthB]
	SB11-5H (40'-42')	[150,000 mg/kg EthB]
	SB11-7G (30'-32')	[410 mg/kg TCE; 64,000 mg/kg EthB]
	SB11-10G (30'-32')	[1,500 mg/kg Benzene; 540,000 mg/kg EthB]
1996	SB11-203 (30'-41')	[20,000 mg/kg EthB]
	SB11-202 (39'-41')	[120,000 mg/kg EthB]

Screening Data

Screening (OVM) data shows vertical extent expands the contamination thickness as follows:

SB11-202 (31'-55')
 SB11-203 (33'-45')
 SB11-10 (30'-42')
 SB11-5 (35'-42')
 SB11-7 (30'-42')
 SB11-1 (35'-37')

These
 thicknesses
 will determine
 vertical extent

Area of Contam

(see Fig 3-23 as marked up Titled "Area 11 Contaminated Areas + Volumes" Dated: 7/16/98)

Scale 1" = 60' , 1 in² = 3600 ft²

$$① 0.94" \times 0.72" = 0.677 \text{ in}^2 \times 3600 \text{ ft}^2/\text{in}^2 = \underline{2,437 \text{ ft}^2}$$

$$② 1.063" \times 0.625" = 0.664 \text{ in}^2 \times 3600 \text{ ft}^2/\text{in}^2 = \underline{2,392 \text{ ft}^2}$$

$$③ (3.32" \times 1.063") - 0.047 \text{ in}^2 = 3.48 \text{ in}^2 \times 3600 \text{ ft}^2/\text{in}^2 = \underline{12,536 \text{ ft}^2}$$

[Beneath Bldg] ④ $1.063" \times 2.125" = 2.26 \text{ in}^2 \times 3600 \text{ ft}^2/\text{in}^2 = \underline{8,132 \text{ ft}^2}$

Total Area Un-covered = $17,365 \text{ ft}^2$

Total Area Beneath Bldg = $8,132 \text{ ft}^2$

Total Contaminated Area = $25,497 \text{ ft}^2$

water level
~30ft bgs

Location	Area (ft ²)	(ft bgs) Contam. Thickness	Water Level (ft bgs)	<wbl In-situ Volume (ft ³)	>wbl Saturated Volume (ft ³)	Clean Backfill (ft ³)
1	2,437	33'-45'	30'	0	29,244	80,421
2	2,392	31'-55'	30'	0	57,408	74,152
3	12,536	30'-42'	30'	0	150,432	376,090
In situ ④	8,132	31'-45'	30'	0	113,848	NA

Total Contaminated Volume = $237,084 \text{ ft}^3 = \underline{8781 \text{ yd}^3}$
 (Ex-situ only)

[Volume Beneath Bldg - In situ = $113,848 \text{ ft}^3 = \underline{4,217 \text{ yd}^3}$]

Total Clean Backfill = $530,653 \text{ ft}^3 = \underline{19,654 \text{ yd}^3}$

Total Excavated Volume = $767,737 \text{ ft}^3 = \underline{28,425 \text{ yd}^3}$

Appendix H-4: Subsurface Soil Data (Volatile Organics)

* = Exceeds Tier II Area II
 ○ Subsurface Samples Area II which have at least 1 compound in exceedance of Tier II goals

Date Sampled	9/24/93	9/24/93	7/13/93	7/13/93	8/25/93
Sample Number	SB7-24A	SB7-24B	SB9-1F	SB9-1F(D)	SB11-1G
Organic Traffic Report Number	EXS12	EXS13	EXR56	EXR57	EXR76

Volatile Organics (u/g)

Chloromethane	26000 U	11 U	10 U	10 U	55000 U
Bromomethane	26000 U	11 U	10 U	10 U	55000 U
Vinyl Chloride	26000 U	11 U	10 U	10 U	55000 U
Chloroethane	26000 U	11 U	10 U	10 U	55000 U
Methylene Chloride	26000 U	12	10 U	10 U	55000 U
Acetone	8400 U	27	10 UB	10 UB	55000 U
Carbon Disulfide	26000 U	11 U	10 U	10 U	55000 U
1,1-Dichloroethene	26000 U	4 J	10 U	10 U	55000 U
1,1-Dichloroethane	26000 U	190	10 U	10 U	55000 U
1,2-Dichloroethene (total)	26000 U	9 J	10 U	10 U	55000 U
Chloroform	26000 U	11 U	10 U	10 U	55000 U
1,2-Dichloroethane	26000 U	180	10 U	10 U	55000 U
2-Butanone	35000 U	13	10 U	10 U	55000 U
1,1,1-Trichloroethane	360000	51	10 U	10 U	55000 U
Carbon Tetrachloride	26000 U	11 U	10 U	10 U	55000 U
Bromodichloromethane	26000 U	11 U	10 U	10 U	55000 U
1,2-Dichloropropane	26000 U	11 U	10 U	10 U	55000 U
cis-1,3-Dichloropropene	26000 U	11 U	10 U	10 U	55000 U
Trichloroethene	24000 U	21	10 U	10 U	55000 U
Dibromochloromethane	26000 U	11 U	10 U	10 U	55000 U
1,1,2-Trichloroethane	26000 U	11 U	10 U	10 U	55000 U
Benzene	26000 U	11 U	10 U	10 U	55000 U
trans-1,3-Dichloropropene	26000 U	11 U	10 U	10 U	55000 U
Bromoform	26000 U	11 U	10 U	10 U	55000 U
4-Methyl-2-Pentanone	26000 U	82	10 U	10 U	55000 U
2-Hexanone	26000 U	11 U	10 U	10 U	55000 U
Tetrachloroethene	110000	22	5 J	5 J	55000 U
1,1,2,2-Tetrachloroethane	26000 U	11 U	10 U	10 U	55000 U
Toluene	26000 U	4 J	10 U	10 U	930000
Chlorobenzene	26000 U	11 U	10 U	10 U	55000 U
Ethylbenzene	15000 U	11 U	10 U	10 U	56000
Styrene	26000 U	11 U	10 U	10 U	55000 U
Xylene	110000	19	10 U	10 U	200000

Appendix H-4: Subsurface Soil Data (Volatile Organics)

Date Sampled	8/27/93	8/26/93	8/26/93	8/31/93	8/31/93
Sample Number	SB11-4L	SB11-5H	SB11-5K	SB11-6G	SB11-6I
Organic Traffic Report Number	EXR84	EXR81	EXR82	EXR88	EXR89

Volatile Organics (ug/kg)

Chloromethane	11 U	27000 U	24 U	12 U	12 U
Bromomethane	11 U	27000 U	24 U	12 U	12 U
Vinyl Chloride	11 U	27000 U	24 U	12 U	12 U
Chloroethane	11 U	27000 U	24 U	12 U	12 U
Methylene Chloride	3 J	27000 U	24 U	24 BJ	30 BJ
Acetone	11 UB	27000 U	24 UB	7 J	6 J
Carbon Disulfide	11 U	27000 U	24 U	12 U	1 J
1,1-Dichloroethene	11 U	27000 U	24 U	12 U	12 U
1,1-Dichloroethane	11 U	27000 U	24 U	12 U	12 U
1,2-Dichloroethene (total)	11 U	27000 U	24 U	12 U	12 U
Chloroform	11 U	27000 U	24 U	12 U	12 U
1,2-Dichloroethane	11 U	27000 U	24 U	12 U	12 U
2-Butanone	11 U	27000 U	24 U	12 U	12 U
1,1,1-Trichloroethane	2 J	27000 U	24 U	12 U	3 J
Carbon Tetrachloride	11 U	27000 U	24 U	12 U	12 U
Bromodichloromethane	11 U	27000 U	24 U	12 U	12 U
1,2-Dichloropropane	11 U	27000 U	24 U	12 U	12 U
cis-1,3-Dichloropropene	11 U	27000 U	24 U	12 U	12 U
Trichloroethene	11 U	27000 U	24 U	12 U	12 U
Dibromochloromethane	11 U	27000 U	24 U	12 U	12 U
1,1,2-Trichloroethane	11 U	27000 U	24 U	12 U	12 U
Benzene	5 J	27000 U	24 UB	12 U	12 U
trans-1,3-Dichloropropene	11 U	27000 U	24 U	12 U	12 U
Bromoform	11 U	27000 U	24 U	12 U	12 U
4-Methyl-2-Pentanone	11 U	27000 U	24 U	12 U	12 U
2-Hexanone	11 U	27000 U	24 U	12 U	12 U
Tetrachloroethene	11 U	27000 U	24 U	12 U	12 U
1,1,2,2-Tetrachloroethane	11 U	27000 U	24 U	12 U	12 U
Toluene	72 JB	230000 J	24 UB	9 J	2 J
Chlorobenzene	11 U	27000 UJ	24 U	12 U	12 U
Ethylbenzene	11 U	150000	24 U	12 U	12 U
Styrene	11 U	27000 U	24 U	12 U	12 U
Xylene	15	530000	760	12 U	12 U

Appendix H-4: Subsurface Soil Data (Volatile Organics)

Date Sampled	9/1/93	9/1/93	8/30/93	8/30/93
Sample Number	SB11-7G	SB11-7K	SB11-8I	SB11-8(D)
Organic Traffic Report Number	EXR91	EXR92	EXR85	EXR87

Volatile Organics (uugal)

Chloromethane	1300 U	12 U	1400 U	1500 U
Bromomethane	1300 U	12 U	1400 U	1500 U
Vinyl Chloride	1300 U	12 U	1400 U	1500 U
Chloroethane	1300 U	12 U	1400 U	1500 U
Methylene Chloride	1300 UB	12 UB	2200	2900
Acetone	1300 UB	18 UB	1400 U	1500 U
Carbon Disulfide	1300 U	2 U	1400 U	1500 U
1,1-Dichloroethane	1300 U	12 U	1400 U	1500 U
1,1-Dichloroethane	1300 U	12 U	1400 U	1500 U
1,2-Dichloroethane (total)	1300 U	12 U	1400 U	1500 U
Chloroform	1300 U	12 U	1400 U	1500 U
1,2-Dichloroethane	1300 U	12 U	1400 U	1500 U
2-Butanone	1300 U	12 UB	1400 U	1500 U
1,1,1-Trichloroethane	1300 U	12 U	1400 U	1500 U
Carbon Tetrachloride	1300 U	12 U	1400 U	1500 U
Bromodichloromethane	1300 U	12 U	1400 U	1500 U
1,2-Dichloropropane	1300 U	12 U	1400 U	1500 U
cis-1,3-Dichloropropene	1300 U	12 U	1400 U	1500 U
Trichloroethene	410 J	12 U	1400 U	1500 U
Dibromochloromethane	1300 U	12 U	1400 U	1500 U
1,1,2-Trichloroethane	1300 U	12 U	1400 U	1500 U
Benzene	1300 U	12 U	1400 U	1500 U
trans-1,3-Dichloropropene	1300 U	12 U	1400 U	1500 U
Bromoform	1300 U	12 U	1400 U	1500 U
4-Methyl-2-Pentanone	1300 U	12 U	1400 U	1500 U
2-Hexanone	1300 U	12 U	1400 U	1500 U
Tetrachloroethene	1300 U	12 U	1400 U	1500 U
1,1,2,2-Tetrachloroethane	1300 U	12 U	1400 U	1500 U
Toluene	150000 D	9 J	43000 D	1500 U
Chlorobenzene	1300 U	12 U	1400 U	1500 U
Ethylbenzene	64000 D	12 U	1400 U	1500 U
Styrene	1300 U	12 U	1400 U	1500 U
Xylene	310000 D	8 J	2000	1500 U

Appendix H-4: Subsurface Soil Data (Volatile Organics)

Date Sampled	8/31/93	9/1/93	9/1/93	12/1/93	12/1/93
Sample Number	SB11-9G	SB11-10G	SB11-10J	SB12-1D	SB12-1H
Organic Traffic Report Number	EXR90	EXR93	EXR94	EXT40	EXT41

Volatile Organics (ug/kg)

Chloromethane	12 U	1400 U	11 U	11 U	1400 U
Bromomethane	12 U	1400 U	11 U	11 U	1400 U
Vinyl Chloride	12 U	1400 U	11 U	11 U	1400 U
Chloroethane	12 U	1400 U	11 U	11 U	1400 U
Methylene Chloride	53 BJ	1400 UB	11 UB	11 U	310 J
Acetone	12 U	1400 U	16 UB	11 U	1400 U
Carbon Disulfide	3 J	1400 U	2 J	11 U	1400 U
1,1-Dichloroethene	12 U	1400 U	11 U	11 U	1400 U
1,1-Dichloroethane	12 U	1400 U	11 U	11 U	1400 U
1,2-Dichloroethene (total)	12 U	1400 U	11 U	11 U	1400 U
Chloroform	12 U	1400 U	11 U	11 U	1400 U
1,2-Dichloroethane	12 U	1400 U	11 U	11 U	1400 U
2-Butanone	12 U	1400 U	11 UB	11 U	7400 J
1,1,1-Trichloroethane	12 U	1400 U	11 U	11 U	1400 U
Carbon Tetrachloride	12 U	1400 U	11 U	11 U	1400 U
Bromodichloromethane	12 U	1400 U	11 U	11 U	1400 U
1,2-Dichloropropane	12 U	1400 U	11 U	11 U	1400 U
cis-1,3-Dichloropropene	12 U	1400 U	11 U	11 U	1400 U
Trichloroethene	12 U	1400 U	11 U	11 U	1400 U
Dibromochloromethane	12 U	1400 U	11 U	11 U	1400 U
1,1,2-Trichloroethane	12 U	1400 U	11 U	11 U	1400 U
Benzene	12 U	* 1500 *	11 U	11 U	1400 U
trans-1,3-Dichloropropene	12 U	1400 U	11 U	11 U	1400 U
Bromoform	12 U	1400 U	11 U	11 U	1400 U
4-Methyl-2-Pentanone	12 U	1400 U	11 U	11 U	1400 U
2-Hexanone	12 U	1400 U	11 U	11 U	1400 U
Tetrachloroethene	12 U	1400 U	11 U	130	250 J
1,1,2,2-Tetrachloroethane	12 U	1400 U	11 U	11 U	1400 U
Toluene	12 U	1400000 D	12	11 U	1400 U
Chlorobenzene	12 U	1400 U	11 U	11 U	1400 U
Ethylbenzene	12 U	* 590000 D	2 J	11 U	1400 U
Styrene	12 U	1400 U	11 U	11 U	1400 U
Xylene	12 U	2300000 D	23	11 U	180 J

APPENDIX C.2

SOURCE AREA REINJECTION RATE CALCULATION

Reinjection Rates

$$\Delta h = \frac{2.3q}{4\pi kb} \times \log \left(\frac{2.25kbt}{r_w^2 S} \right) + 52560$$

q = pump rate

k = hydraulic conductivity

b = aquifer thickness

t = time

r_w = effective well radius

S = Storage coefficient Typically = 0.1

AREA 4 - No

Δh = draw down

$$= \frac{2.3 (5 \text{ gal/min})}{4\pi (2.4 \times 10^{-3} \text{ ft/min}) (33 \text{ ft})} \cdot \log \left(\frac{2.25 (2.4 \times 10^{-3} \text{ ft/min}) (33 \text{ ft}) (52560)}{(.16)^2 (.1)} \right)$$

$$= 11.55 \times 7.56 = 1.54 \cdot (7.56 + 7.56 + 7.56 + 7.56) = \boxed{46.5 \text{ ft}} \quad \begin{matrix} 6w@ \\ 35 \text{ sec} \end{matrix}$$

AREA 9/10

$$= \frac{(2.3)(1 \text{ gal/min})}{4\pi (2.4 \times 10^{-3}) (100 \text{ ft})} \cdot \log \left[\frac{2.25 (2.4 \times 10^{-3}) (100) (525600)}{(.16)^2 (.1)} \right]$$

$$.10 \times 8.04$$

$$= 0.10 \times (8.04 \times 50)$$

$$= 40.2 \text{ ft}$$

6w@ 30-35ft

80% Back

AREA 11 - 10

$$= \frac{(2.3)(4.5)}{4\pi(2.4 \times 10^{-3})(100\text{ft})} \cdot \log \left[\frac{2.25(2.4 \times 10^{-3})(100)(525600)}{(0.16)^2(0.1)} \right]$$

$$0.46 \times [(8.04)(9\text{wells})]$$

$$= 33.3\text{ft}$$

GW @ 30 feet

90% Borch

APPENDIX C.3

WHPA MODEL CALCULATIONS

AREA 4

- Transmissivity (ft²/day)

$$T = k \cdot b$$

k = hydraulic gradient

b = saturated thickness

$$k = 4 \times 10^{-5} \frac{\text{ft}}{\text{sec}} \times \frac{60 \text{ sec}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{24 \text{ hr}}{\text{day}}$$

$$= 3.456 \text{ ft/day}$$

$$T = 3.456 \frac{\text{ft}}{\text{day}} \times 33 \text{ ft} = \boxed{114.048 \text{ ft}^2/\text{day}}$$

- Aquifer Thickness (feet)

33' → (May 1997 R.I.)

- Aquifer Porosity (dimensionless)

0.25 → ~ general for sand/gravel

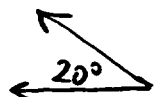
- Hydraulic Gradient (dimensionless)

Distance between flow lines = 660 feet

Change in groundwater level = 5 feet

$$= \frac{5}{660} = \boxed{0.008}$$

- Angle of Ambient Flow (degrees)



$$\rightarrow 270 + 20 = \boxed{290^\circ}$$

- Pumping Rate (ft³/day)

$$20 \frac{\text{gal}}{\text{min}} \times 0.002228 = 0.04456 \frac{\text{ft}^3}{\text{sec}} \times \frac{60 \text{ sec}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{24 \text{ hr}}{\text{day}}$$

$$= \boxed{3850 \text{ ft}^3/\text{day}}$$

$$/4 = 962.5 \text{ ft}^3/\text{day}$$

WHPA MODELING

AREA 7

Depth to Bedrock varies from 35 feet on the valley flank to >135 feet in the valley center.

GW Flow is to the northwest
Localized is to the creek

GW ranges from 36 feet south of Park to 13 feet within park to less than 2 feet near creek

TRANSMISSIVITY

$$T = k \cdot b$$

k = hydraulic conductivity
b = Saturated Thickness

$$T = 4.0 \times 10^{-5} \text{ ft/sec}$$

GW @ 2 - 36 feet bgs.

35 > 135 in Valley Bedrock

135 - 13 = 122 feet Saturated thickness

20 - 13 = 7 feet saturated

$$(4.0 \times 10^{-5})(7) \times \frac{60}{1} \times \frac{60}{1} \times \frac{24}{1} = 24.192$$

$$17 + 270 = 287^\circ$$

$$\frac{10}{450} = \boxed{.022}$$

AREA 9/10

— Transmissivity (ft²/day)

$$T = k \cdot b$$

k = hydraulic gradient

b = saturated thickness

$$k = 4 \times 10^{-5} \text{ ft/sec} = 3.456 \text{ ft/day}$$

$$T = 3.456 \text{ ft/day} \times (101' - 32') = 238.464 \text{ ft}^2/\text{day}$$

— Aquifer Thickness (feet)

101 feet

— Aquifer Porosity (dimensionless)

0.25

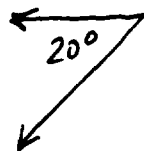
— Hydraulic Gradient (dimensionless)

Distance between flow lines = 2,000 feet

Change in groundwater level = 4 feet

$$= \frac{4'}{2000'} = 0.002$$

— Angle of Ambient Flow (degrees)



$$270^\circ - 20^\circ = 250^\circ$$

— Pumping Rate (ft³/day)

$$40 \frac{\text{gal}}{\text{min}} \times 0.002228 = 0.08912 \frac{\text{ft}^3}{\text{sec}} \times \frac{60 \text{ sec}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{24 \text{ hr}}{\text{day}}$$

$$= 7699.968$$

$$= 7700 \text{ ft}^3/\text{day}$$

$$/9 = 855.5 \text{ ft}^3/\text{day}$$

AREA 11

- Transmissivity (ft²/day)

$$T = k \cdot b$$

k = hydraulic gradient

b = saturated thickness

$$k = 4 \times 10^{-5} \frac{\text{ft}}{\text{sec}} \times \frac{60 \text{ sec}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{24 \text{ hr}}{\text{day}}$$

$$= 3.456 \text{ ft/day}$$

$$T = 3.456 \text{ ft/day} \times (101' - 32') = 238.464 \text{ ft}^2/\text{day}$$

Similar to Area 9

- Aquifer Thickness (feet)

101 feet

- Aquifer Porosity (dimensionless)

0.25

- Hydraulic Gradient (dimensionless)

Distance between flow lines = 630 feet

Change in groundwater level = 5 feet

$$= \frac{5 \text{ feet}}{630 \text{ feet}} = 0.008$$

- Angle of Ambient flow (degrees)



$$23^\circ + 270^\circ = 293^\circ$$

- Pumping Rate (ft³/day)

$$50 \text{ gpm} \times 0.002228 = 0.1114 \frac{\text{ft}^3}{\text{sec}} \times \frac{60 \text{ sec}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{24 \text{ hr}}{1 \text{ day}}$$

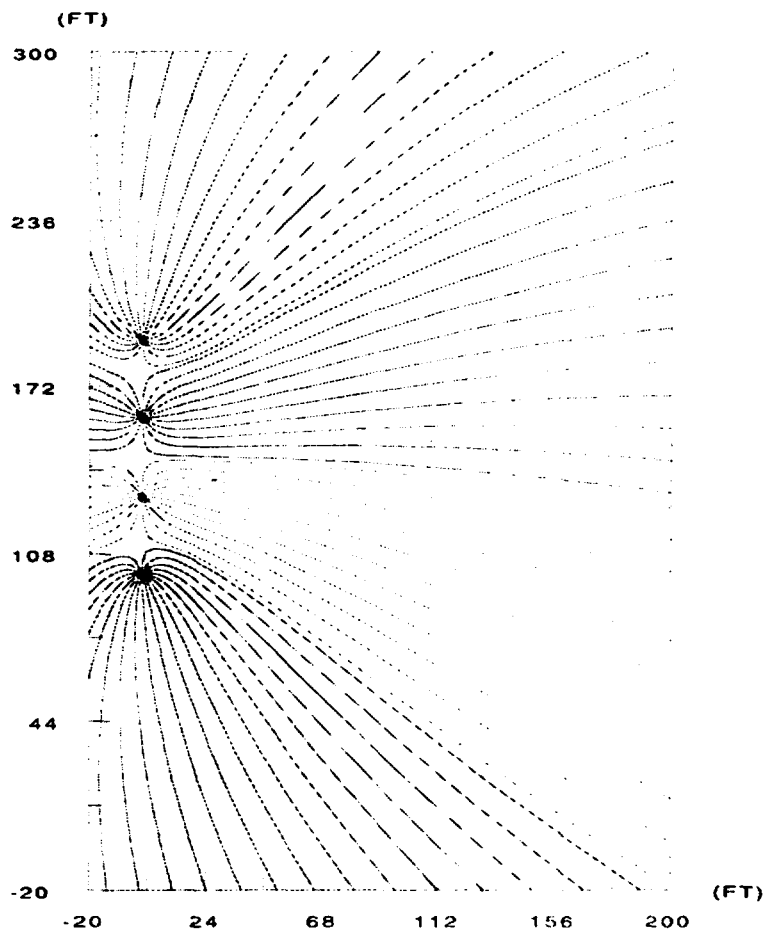
$$\text{Total} = 9625 \text{ ft}^3/\text{day} \quad / 9 \text{ well} = 1069 \text{ ft}^3/\text{day}$$

b

1 year

20 gpm

4 Wells



Rockford FS - Area 4

FT AND DA SYSTEM OF UNITS IS USED

REGIONAL FLOW, PORE VELOCITY = 0.11 FT/DAY
ORIENTATION OF REGIONAL FLOW = 160.00 DEGREES
THICKNESS OF THE AQUIFER = 33.00 FEET
POROSITY = 25.00 PERCENT
PERIOD STUDIED = 365.00 DAYS
INITIAL AQUIFER CONCENTRATION = 0.000E-01
DEFAULT INJECTION CONCENTRATION = 0.000E-01
STREAMLINE STEP LENGTH = 1.10 FEET
ADSORPTION CAPACITY OF ROCK = 00.00 PERCENT

NUMBER OF INJECTION WELLS = 0

NUMBER OF PUMPING WELLS = 4

1 4 PRODUCTION WELLS

WELL NAME	X FEET	Y FEET	FLOW-RATE FT3/DAY	RADIUS INDICATOR FEET
0.00	100.00	962.50	2.50E-01	0
0.00	130.00	962.50	2.50E-01	0
0.00	160.00	962.50	2.50E-01	0
0.00	190.00	962.50	2.50E-01	0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	366.3 DAYS	0.0
2	+++NONE+++	365.9 DAYS	18.0
3	+++NONE+++	365.1 DAYS	36.0
4	+++NONE+++	366.3 DAYS	54.0
5	+++NONE+++	366.6 DAYS	72.0
6	+++NONE+++	366.1 DAYS	90.0
7	+++NONE+++	365.8 DAYS	108.0
8	+++NONE+++	365.4 DAYS	126.0
9	+++NONE+++	366.2 DAYS	144.0
10	+++NONE+++	365.7 DAYS	162.0
11	+++NONE+++	367.3 DAYS	180.0
12	+++NONE+++	368.1 DAYS	198.0
13	+++NONE+++	365.1 DAYS	216.0
14	+++NONE+++	367.8 DAYS	234.0

15	+++NONE+++	367.0 DAYS	252.0
16	+++NONE+++	365.7 DAYS	270.0
17	+++NONE+++	367.1 DAYS	288.0
18	+++NONE+++	365.2 DAYS	306.0
19	+++NONE+++	365.9 DAYS	324.0
20	+++NONE+++	366.3 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	366.0 DAYS	0.0
2	+++NONE+++	367.4 DAYS	18.0
3	+++NONE+++	365.3 DAYS	36.0
4	+++NONE+++	365.1 DAYS	54.0
5	+++NONE+++	366.5 DAYS	72.0
6	+++NONE+++	367.6 DAYS	90.0
7	+++NONE+++	367.8 DAYS	108.0
8	+++NONE+++	366.7 DAYS	126.0
9	+++NONE+++	366.0 DAYS	144.0
10	+++NONE+++	366.4 DAYS	162.0
11	+++NONE+++	368.3 DAYS	180.0
12	+++NONE+++	368.3 DAYS	198.0
13	+++NONE+++	366.8 DAYS	216.0
14	+++NONE+++	367.2 DAYS	234.0
15	+++NONE+++	366.1 DAYS	252.0
16	+++NONE+++	365.0 DAYS	270.0
17	+++NONE+++	367.1 DAYS	288.0
18	+++NONE+++	366.0 DAYS	306.0
19	+++NONE+++	366.7 DAYS	324.0
20	+++NONE+++	366.7 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	366.7 DAYS	0.0
2	+++NONE+++	366.6 DAYS	18.0
3	+++NONE+++	365.8 DAYS	36.0
4	+++NONE+++	367.0 DAYS	54.0
5	+++NONE+++	367.3 DAYS	72.0
6	+++NONE+++	366.9 DAYS	90.0
7	+++NONE+++	366.0 DAYS	108.0

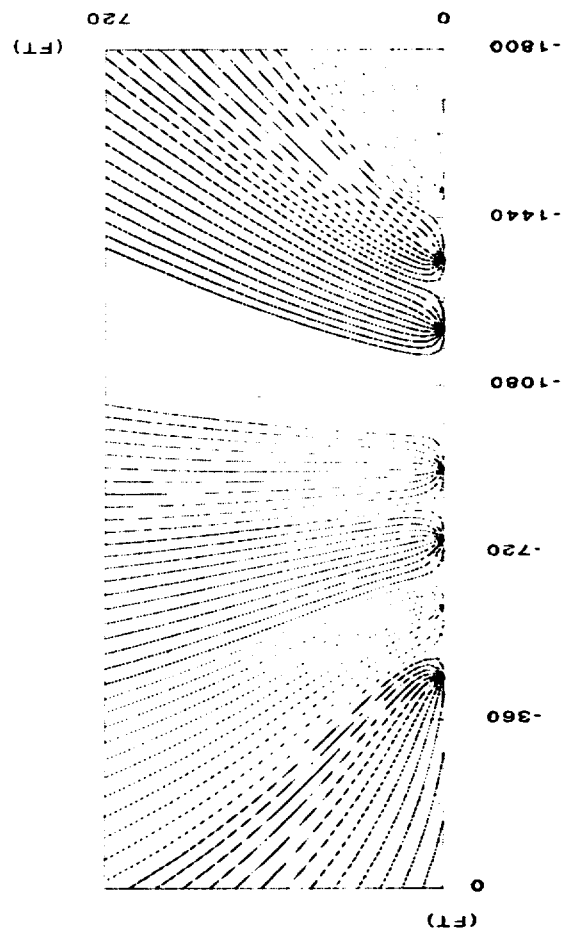
8	+++NONE+++	368.1 DAYS	126.0
9	+++NONE+++	366.3 DAYS	144.0
10	+++NONE+++	365.4 DAYS	162.0
11	+++NONE+++	365.4 DAYS	180.0
12	+++NONE+++	366.5 DAYS	198.0
13	+++NONE+++	368.6 DAYS	216.0
14	+++NONE+++	367.1 DAYS	234.0
15	+++NONE+++	365.9 DAYS	252.0
16	+++NONE+++	367.3 DAYS	270.0
17	+++NONE+++	365.2 DAYS	288.0
18	+++NONE+++	365.6 DAYS	306.0
19	+++NONE+++	367.7 DAYS	324.0
20	+++NONE+++	366.2 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
--	-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	367.8 DAYS	0.0
2	+++NONE+++	367.4 DAYS	18.0
3	+++NONE+++	366.7 DAYS	36.0
4	+++NONE+++	365.7 DAYS	54.0
5	+++NONE+++	367.6 DAYS	72.0
6	+++NONE+++	365.7 DAYS	90.0
7	+++NONE+++	366.7 DAYS	108.0
8	+++NONE+++	367.1 DAYS	126.0
9	+++NONE+++	366.6 DAYS	144.0
10	+++NONE+++	368.6 DAYS	162.0
11	+++NONE+++	365.5 DAYS	180.0
12	+++NONE+++	368.2 DAYS	198.0
13	+++NONE+++	368.9 DAYS	216.0
14	+++NONE+++	366.9 DAYS	234.0
15	+++NONE+++	369.0 DAYS	252.0
16	+++NONE+++	367.6 DAYS	270.0
17	+++NONE+++	367.5 DAYS	288.0
18	+++NONE+++	366.5 DAYS	306.0
19	+++NONE+++	367.5 DAYS	324.0
20	+++NONE+++	367.9 DAYS	342.0

Area 7



Southeast Rockford FS - Area 7

FT AND DA SYSTEM OF UNITS IS USED
 REGIONAL FLOW, PORE VELOCITY = 0.11 FT/DAY
 ORIENTATION OF REGIONAL FLOW = 153.00 DEGREES
 THICKNESS OF THE AQUIFER = 20.00 FEET
 POROSITY = 25.00 PERCENT
 PERIOD STUDIED = 3650.00 DAYS
 INITIAL AQUIFER CONCENTRATION = 0.000E-01
 DEFAULT INJECTION CONCENTRATION = 0.000E-01
 STREAMLINE STEP LENGTH = 9.00 FEET
 ADSORPTION CAPACITY OF ROCK = 00.00 PERCENT

NUMBER OF INJECTION WELLS = 0
 NUMBER OF PUMPING WELLS = 8

1 8 PRODUCTION WELLS

WELL NAME	X FEET	Y FEET	FLOW-RATE FT3/DAY	RADIUS INDICATOR FEET
0.00	-450.00	1203.00	2.50E-01	0
0.00	-600.00	1203.00	2.50E-01	0
0.00	-750.00	1203.00	2.50E-01	0
0.00	-900.00	1203.00	2.50E-01	0
0.00	-1050.00	1203.00	2.50E-01	0
0.00	-1200.00	1203.00	2.50E-01	0
0.00	-1350.00	1203.00	2.50E-01	0
0.00	-1500.00	1203.00	2.50E-01	0

50 gpm

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
1	+++NONE+++	3657.8 DAYS	0.0
2	+++NONE+++	3652.0 DAYS	18.0
3	+++NONE+++	3685.2 DAYS	36.0
4	+++NONE+++	3677.9 DAYS	54.0
5	+++NONE+++	3668.7 DAYS	72.0
6	+++NONE+++	3656.7 DAYS	90.0
7	+++NONE+++	3683.2 DAYS	108.0
8	+++NONE+++	3663.2 DAYS	126.0
9	+++NONE+++	3680.5 DAYS	144.0
10	+++NONE+++	3691.5 DAYS	162.0

11	+++NONE+++	3694.1 DAYS	180.0
12	+++NONE+++	3687.2 DAYS	198.0
13	+++NONE+++	3668.5 DAYS	216.0
14	+++NONE+++	3683.2 DAYS	234.0
15	+++NONE+++	3681.8 DAYS	252.0
16	+++NONE+++	3678.4 DAYS	270.0
17	+++NONE+++	3672.9 DAYS	288.0
18	+++NONE+++	3671.5 DAYS	306.0
19	+++NONE+++	3668.2 DAYS	324.0
20	+++NONE+++	3663.5 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	3673.1 DAYS	0.0
2	+++NONE+++	3675.3 DAYS	18.0
3	+++NONE+++	3673.6 DAYS	36.0
4	+++NONE+++	3667.3 DAYS	54.0
5	+++NONE+++	3656.3 DAYS	72.0
6	+++NONE+++	3680.2 DAYS	90.0
7	+++NONE+++	3698.9 DAYS	108.0
8	+++NONE+++	3697.7 DAYS	126.0
9	+++NONE+++	3688.9 DAYS	144.0
10	+++NONE+++	3664.0 DAYS	162.0
11	+++NONE+++	3674.7 DAYS	180.0
12	+++NONE+++	3665.8 DAYS	198.0
13	+++NONE+++	3691.1 DAYS	216.0
14	+++NONE+++	3691.1 DAYS	234.0
15	+++NONE+++	3661.5 DAYS	252.0
16	+++NONE+++	3656.0 DAYS	270.0
17	+++NONE+++	3664.8 DAYS	288.0
18	+++NONE+++	3680.1 DAYS	306.0
19	+++NONE+++	3658.2 DAYS	324.0
20	+++NONE+++	3667.3 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
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1	+++NONE+++	3676.1 DAYS	0.0
2	+++NONE+++	3663.1 DAYS	18.0
3	+++NONE+++	3678.3 DAYS	36.0

4	+++NONE+++	3655.5 DAYS	54.0
5	+++NONE+++	3661.3 DAYS	72.0
6	+++NONE+++	3669.1 DAYS	90.0
7	+++NONE+++	3653.9 DAYS	108.0
8	+++NONE+++	3683.9 DAYS	126.0
9	+++NONE+++	3689.4 DAYS	144.0
10	+++NONE+++	3666.9 DAYS	162.0
11	+++NONE+++	3678.9 DAYS	180.0
12	+++NONE+++	3664.4 DAYS	198.0
13	+++NONE+++	3685.2 DAYS	216.0
14	+++NONE+++	3679.1 DAYS	234.0
15	+++NONE+++	3706.8 DAYS	252.0
16	+++NONE+++	3658.4 DAYS	270.0
17	+++NONE+++	3654.1 DAYS	288.0
18	+++NONE+++	3656.8 DAYS	306.0
19	+++NONE+++	3656.4 DAYS	324.0
20	+++NONE+++	3652.0 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	3676.4 DAYS	0.0
2	+++NONE+++	3654.2 DAYS	18.0
3	+++NONE+++	3658.9 DAYS	36.0
4	+++NONE+++	3658.8 DAYS	54.0
5	+++NONE+++	3654.9 DAYS	72.0
6	+++NONE+++	3655.6 DAYS	90.0
7	+++NONE+++	3683.1 DAYS	108.0
8	+++NONE+++	3650.1 DAYS	126.0
9	+++NONE+++	3650.5 DAYS	144.0
10	+++NONE+++	3682.8 DAYS	162.0
11	+++NONE+++	3693.1 DAYS	180.0
12	+++NONE+++	3684.0 DAYS	198.0
13	+++NONE+++	3658.0 DAYS	216.0
14	+++NONE+++	3668.0 DAYS	234.0
15	+++NONE+++	3668.5 DAYS	252.0
16	+++NONE+++	3670.7 DAYS	270.0
17	+++NONE+++	3658.7 DAYS	288.0
18	+++NONE+++	3653.0 DAYS	306.0
19	+++NONE+++	3675.5 DAYS	324.0
20	+++NONE+++	3662.4 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
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1	+++NONE+++	3671.5 DAYS	0.0
2	+++NONE+++	3672.6 DAYS	18.0
3	+++NONE+++	3669.1 DAYS	36.0
4	+++NONE+++	3661.2 DAYS	54.0
5	+++NONE+++	3680.9 DAYS	72.0
6	+++NONE+++	3675.6 DAYS	90.0
7	+++NONE+++	3687.5 DAYS	108.0
8	+++NONE+++	3668.4 DAYS	126.0
9	+++NONE+++	3683.3 DAYS	144.0
10	+++NONE+++	3682.5 DAYS	162.0
11	+++NONE+++	3668.2 DAYS	180.0
12	+++NONE+++	3686.3 DAYS	198.0
13	+++NONE+++	3650.5 DAYS	216.0
14	+++NONE+++	3691.2 DAYS	234.0
15	+++NONE+++	3650.5 DAYS	252.0
16	+++NONE+++	3672.4 DAYS	270.0
17	+++NONE+++	3654.5 DAYS	288.0
18	+++NONE+++	3672.4 DAYS	306.0
19	+++NONE+++	3655.6 DAYS	324.0
20	+++NONE+++	3665.8 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
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1	+++NONE+++	3660.9 DAYS	0.0
2	+++NONE+++	3652.8 DAYS	18.0
3	+++NONE+++	3672.0 DAYS	36.0
4	+++NONE+++	3655.4 DAYS	54.0
5	+++NONE+++	3666.9 DAYS	72.0
6	+++NONE+++	3653.8 DAYS	90.0
7	+++NONE+++	3663.2 DAYS	108.0
8	+++NONE+++	3675.4 DAYS	126.0
9	+++NONE+++	3682.4 DAYS	144.0
10	+++NONE+++	3680.0 DAYS	162.0
11	+++NONE+++	3669.2 DAYS	180.0
12	+++NONE+++	3651.4 DAYS	198.0
13	+++NONE+++	3665.5 DAYS	216.0
14	+++NONE+++	3674.6 DAYS	234.0
15	+++NONE+++	3653.2 DAYS	252.0
16	+++NONE+++	3674.9 DAYS	270.0

17	+++NONE+++	3681.7 DAYS	288.0
18	+++NONE+++	3658.8 DAYS	306.0
19	+++NONE+++	3663.9 DAYS	324.0
20	+++NONE+++	3664.6 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
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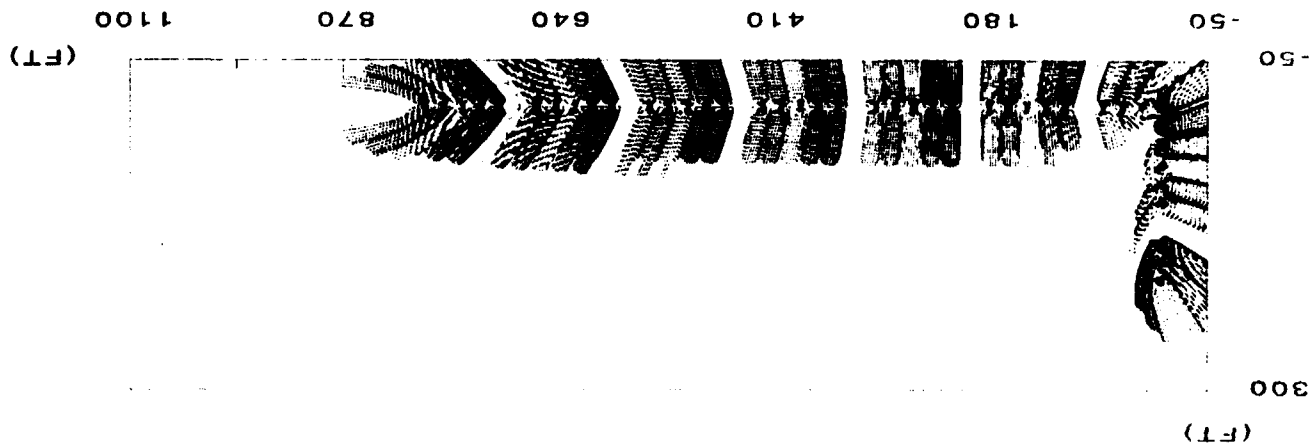
1	+++NONE+++	3670.9 DAYS	0.0
2	+++NONE+++	3650.2 DAYS	18.0
3	+++NONE+++	3658.6 DAYS	36.0
4	+++NONE+++	3663.1 DAYS	54.0
5	+++NONE+++	3664.1 DAYS	72.0
6	+++NONE+++	3671.2 DAYS	90.0
7	+++NONE+++	3682.9 DAYS	108.0
8	+++NONE+++	3671.3 DAYS	126.0
9	+++NONE+++	3657.2 DAYS	144.0
10	+++NONE+++	3673.5 DAYS	162.0
11	+++NONE+++	3683.7 DAYS	180.0
12	+++NONE+++	3652.2 DAYS	198.0
13	+++NONE+++	3652.5 DAYS	216.0
14	+++NONE+++	3685.3 DAYS	234.0
15	+++NONE+++	3652.3 DAYS	252.0
16	+++NONE+++	3653.3 DAYS	270.0
17	+++NONE+++	3682.1 DAYS	288.0
18	+++NONE+++	3677.1 DAYS	306.0
19	+++NONE+++	3668.1 DAYS	324.0
20	+++NONE+++	3655.0 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
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1	+++NONE+++	3657.3 DAYS	0.0
2	+++NONE+++	3653.3 DAYS	18.0
3	+++NONE+++	3681.2 DAYS	36.0
4	+++NONE+++	3672.2 DAYS	54.0
5	+++NONE+++	3660.5 DAYS	72.0
6	+++NONE+++	3653.1 DAYS	90.0
7	+++NONE+++	3661.4 DAYS	108.0
8	+++NONE+++	3674.7 DAYS	126.0
9	+++NONE+++	3683.5 DAYS	144.0

10	+++NONE+++	3650.7 DAYS	162.0
11	+++NONE+++	3684.3 DAYS	180.0
12	+++NONE+++	3677.2 DAYS	198.0
13	+++NONE+++	3665.7 DAYS	216.0
14	+++NONE+++	3685.4 DAYS	234.0
15	+++NONE+++	3665.6 DAYS	252.0
16	+++NONE+++	3677.5 DAYS	270.0
17	+++NONE+++	3650.9 DAYS	288.0
18	+++NONE+++	3656.4 DAYS	306.0
19	+++NONE+++	3659.0 DAYS	324.0
20	+++NONE+++	3659.2 DAYS	342.0



1 year
50 weeks
50 gpm

Rockford FS - Area 9/10

FT AND DA SYSTEM OF UNITS IS USED

REGIONAL FLOW, PORE VELOCITY = 0.02 FT/DAY
ORIENTATION OF REGIONAL FLOW = 200.00 DEGREES
THICKNESS OF THE AQUIFER = 101.00 FEET
POROSITY = 25.00 PERCENT
PERIOD STUDIED = 365.00 DAYS
INITIAL AQUIFER CONCENTRATION = 0.000E-01
DEFAULT INJECTION CONCENTRATION = 0.000E-01
STREAMLINE STEP LENGTH = 5.70 FEET
ADSORPTION CAPACITY OF ROCK = 00.00 PERCENT

NUMBER OF INJECTION WELLS = 0
NUMBER OF PUMPING WELLS = 50

1 50 PRODUCTION WELLS

WELL NAME	X FEET	Y FEET	FLOW-RATE FT3/DAY	RADIUS INDICATOR FEET
0.00	0.00	192.50	2.50E-01	0
20.00	0.00	192.50	2.50E-01	0
40.00	0.00	192.50	2.50E-01	0
60.00	0.00	192.50	2.50E-01	0
80.00	0.00	192.50	2.50E-01	0
100.00	0.00	192.50	2.50E-01	0
120.00	0.00	192.50	2.50E-01	0
140.00	0.00	192.50	2.50E-01	0
160.00	0.00	192.50	2.50E-01	0
180.00	0.00	192.50	2.50E-01	0
200.00	0.00	192.50	2.50E-01	0
220.00	0.00	192.50	2.50E-01	0
240.00	0.00	192.50	2.50E-01	0
260.00	0.00	192.50	2.50E-01	0
280.00	0.00	192.50	2.50E-01	0
300.00	0.00	192.50	2.50E-01	0
320.00	0.00	192.50	2.50E-01	0
340.00	0.00	192.50	2.50E-01	0
360.00	0.00	192.50	2.50E-01	0
380.00	0.00	192.50	2.50E-01	0
400.00	0.00	192.50	2.50E-01	0
420.00	0.00	192.50	2.50E-01	0
440.00	0.00	192.50	2.50E-01	0
460.00	0.00	192.50	2.50E-01	0

480.00	0.00	192.50	2.50E-01	0
500.00	0.00	192.50	2.50E-01	0
520.00	0.00	192.50	2.50E-01	0
540.00	0.00	192.50	2.50E-01	0
560.00	0.00	192.50	2.50E-01	0
580.00	0.00	192.50	2.50E-01	0
600.00	0.00	192.50	2.50E-01	0
620.00	0.00	192.50	2.50E-01	0
640.00	0.00	192.50	2.50E-01	0
660.00	0.00	192.50	2.50E-01	0
680.00	0.00	192.50	2.50E-01	0
700.00	0.00	192.50	2.50E-01	0
720.00	0.00	192.50	2.50E-01	0
740.00	0.00	192.50	2.50E-01	0
760.00	0.00	192.50	2.50E-01	0
780.00	0.00	192.50	2.50E-01	0
800.00	0.00	192.50	2.50E-01	0
0.00	30.00	192.50	2.50E-01	0
0.00	50.00	192.50	2.50E-01	0
0.00	70.00	192.50	2.50E-01	0
0.00	90.00	192.50	2.50E-01	0
0.00	110.00	192.50	2.50E-01	0
0.00	130.00	192.50	2.50E-01	0
0.00	150.00	192.50	2.50E-01	0
0.00	170.00	192.50	2.50E-01	0
0.00	190.00	192.50	2.50E-01	0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
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1	+++NONE+++	389.2 DAYS	0.0
2	+++NONE+++	389.4 DAYS	18.0
3	+++NONE+++	384.4 DAYS	36.0
4	+++NONE+++	387.6 DAYS	54.0
5	+++NONE+++	374.5 DAYS	72.0
6	+++NONE+++	368.3 DAYS	90.0
7	+++NONE+++	366.1 DAYS	108.0
8	+++NONE+++	366.1 DAYS	126.0
9	+++NONE+++	367.5 DAYS	144.0
10	+++NONE+++	369.4 DAYS	162.0
11	+++NONE+++	371.4 DAYS	180.0
12	+++NONE+++	373.0 DAYS	198.0
13	+++NONE+++	374.1 DAYS	216.0

14	+++NONE+++	374.5 DAYS	234.0
15	+++NONE+++	374.3 DAYS	252.0
16	+++NONE+++	373.5 DAYS	270.0
17	+++NONE+++	372.6 DAYS	288.0
18	+++NONE+++	372.0 DAYS	306.0
19	+++NONE+++	372.7 DAYS	324.0
20	+++NONE+++	376.8 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
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1	+++NONE+++	380.6 DAYS	0.0
2	+++NONE+++	368.6 DAYS	18.0
3	+++NONE+++	381.6 DAYS	36.0
4	+++NONE+++	382.3 DAYS	54.0
5	+++NONE+++	368.7 DAYS	72.0
6	+++NONE+++	371.2 DAYS	90.0
7	+++NONE+++	383.6 DAYS	108.0
8	+++NONE+++	377.1 DAYS	126.0
9	+++NONE+++	366.8 DAYS	144.0
10	+++NONE+++	390.8 DAYS	162.0
11	+++NONE+++	387.8 DAYS	180.0
12	+++NONE+++	387.7 DAYS	198.0
13	+++NONE+++	389.1 DAYS	216.0
14	+++NONE+++	390.9 DAYS	234.0
15	+++NONE+++	392.8 DAYS	252.0
16	+++NONE+++	394.5 DAYS	270.0
17	+++NONE+++	366.1 DAYS	288.0
18	+++NONE+++	368.4 DAYS	306.0
19	+++NONE+++	372.7 DAYS	324.0
20	+++NONE+++	382.3 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	377.4 DAYS	0.0
2	+++NONE+++	378.1 DAYS	18.0
3	+++NONE+++	367.9 DAYS	36.0
4	+++NONE+++	430.9 DAYS	54.0
5	+++NONE+++	426.3 DAYS	72.0
6	+++NONE+++	383.2 DAYS	90.0

7	+++NONE+++	365.3 DAYS	108.0
8	+++NONE+++	366.0 DAYS	126.0
9	+++NONE+++	367.8 DAYS	144.0
10	+++NONE+++	385.3 DAYS	162.0
11	+++NONE+++	372.3 DAYS	180.0
12	+++NONE+++	368.0 DAYS	198.0
13	+++NONE+++	367.3 DAYS	216.0
14	+++NONE+++	368.4 DAYS	234.0
15	+++NONE+++	370.5 DAYS	252.0
16	+++NONE+++	373.0 DAYS	270.0
17	+++NONE+++	376.0 DAYS	288.0
18	+++NONE+++	380.0 DAYS	306.0
19	+++NONE+++	386.5 DAYS	324.0
20	+++NONE+++	371.6 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
--	-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	383.1 DAYS	0.0
2	+++NONE+++	377.9 DAYS	18.0
3	+++NONE+++	411.1 DAYS	36.0
4	+++NONE+++	392.1 DAYS	54.0
5	+++NONE+++	390.4 DAYS	72.0
6	+++NONE+++	398.0 DAYS	90.0
7	+++NONE+++	411.2 DAYS	108.0
8	+++NONE+++	426.5 DAYS	126.0
9	+++NONE+++	440.0 DAYS	144.0
10	+++NONE+++	372.2 DAYS	162.0
11	+++NONE+++	367.8 DAYS	180.0
12	+++NONE+++	386.9 DAYS	198.0
13	+++NONE+++	383.8 DAYS	216.0
14	+++NONE+++	383.6 DAYS	234.0
15	+++NONE+++	385.1 DAYS	252.0
16	+++NONE+++	387.6 DAYS	270.0
17	+++NONE+++	391.0 DAYS	288.0
18	+++NONE+++	367.1 DAYS	306.0
19	+++NONE+++	375.0 DAYS	324.0
20	+++NONE+++	390.5 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
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1	+++NONE+++	378.3 DAYS	0.0
2	+++NONE+++	390.1 DAYS	18.0
3	+++NONE+++	402.3 DAYS	36.0
4	+++NONE+++	385.9 DAYS	54.0
5	+++NONE+++	381.8 DAYS	72.0
6	+++NONE+++	384.6 DAYS	90.0
7	+++NONE+++	391.9 DAYS	108.0
8	+++NONE+++	403.0 DAYS	126.0
9	+++NONE+++	418.4 DAYS	144.0
10	+++NONE+++	400.7 DAYS	162.0
11	+++NONE+++	378.2 DAYS	180.0
12	+++NONE+++	378.5 DAYS	198.0
13	+++NONE+++	372.9 DAYS	216.0
14	+++NONE+++	371.3 DAYS	234.0
15	+++NONE+++	371.8 DAYS	252.0
16	+++NONE+++	373.8 DAYS	270.0
17	+++NONE+++	377.1 DAYS	288.0
18	+++NONE+++	382.2 DAYS	306.0
19	+++NONE+++	390.8 DAYS	324.0
20	+++NONE+++	379.0 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
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1	+++NONE+++	391.8 DAYS	0.0
2	+++NONE+++	382.3 DAYS	18.0
3	+++NONE+++	366.2 DAYS	36.0
4	+++NONE+++	394.2 DAYS	54.0
5	+++NONE+++	389.6 DAYS	72.0
6	+++NONE+++	390.7 DAYS	90.0
7	+++NONE+++	395.9 DAYS	108.0
8	+++NONE+++	404.9 DAYS	126.0
9	+++NONE+++	372.3 DAYS	144.0
10	+++NONE+++	400.2 DAYS	162.0
11	+++NONE+++	372.1 DAYS	180.0
12	+++NONE+++	368.0 DAYS	198.0
13	+++NONE+++	389.0 DAYS	216.0
14	+++NONE+++	386.1 DAYS	234.0
15	+++NONE+++	385.9 DAYS	252.0
16	+++NONE+++	387.5 DAYS	270.0
17	+++NONE+++	390.6 DAYS	288.0
18	+++NONE+++	366.6 DAYS	306.0
19	+++NONE+++	375.6 DAYS	324.0

20 +++NONE+++ 392.9 DAYS 342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
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1	+++NONE+++	375.1 DAYS	0.0
2	+++NONE+++	395.2 DAYS	18.0
3	+++NONE+++	383.0 DAYS	36.0
4	+++NONE+++	369.5 DAYS	54.0
5	+++NONE+++	404.9 DAYS	72.0
6	+++NONE+++	405.3 DAYS	90.0
7	+++NONE+++	368.2 DAYS	108.0
8	+++NONE+++	375.6 DAYS	126.0
9	+++NONE+++	388.2 DAYS	144.0
10	+++NONE+++	377.2 DAYS	162.0
11	+++NONE+++	390.8 DAYS	180.0
12	+++NONE+++	383.2 DAYS	198.0
13	+++NONE+++	373.8 DAYS	216.0
14	+++NONE+++	369.7 DAYS	234.0
15	+++NONE+++	368.7 DAYS	252.0
16	+++NONE+++	369.8 DAYS	270.0
17	+++NONE+++	372.6 DAYS	288.0
18	+++NONE+++	377.7 DAYS	306.0
19	+++NONE+++	386.9 DAYS	324.0
20	+++NONE+++	375.2 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
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1	+++NONE+++	377.3 DAYS	0.0
2	+++NONE+++	375.4 DAYS	18.0
3	+++NONE+++	365.5 DAYS	36.0
4	+++NONE+++	390.9 DAYS	54.0
5	+++NONE+++	386.1 DAYS	72.0
6	+++NONE+++	385.8 DAYS	90.0
7	+++NONE+++	389.1 DAYS	108.0
8	+++NONE+++	395.9 DAYS	126.0
9	+++NONE+++	368.9 DAYS	144.0
10	+++NONE+++	376.1 DAYS	162.0
11	+++NONE+++	378.8 DAYS	180.0
12	+++NONE+++	366.9 DAYS	198.0

13	+++NONE+++	385.4 DAYS	216.0
14	+++NONE+++	380.4 DAYS	234.0
15	+++NONE+++	378.8 DAYS	252.0
16	+++NONE+++	379.5 DAYS	270.0
17	+++NONE+++	382.1 DAYS	288.0
18	+++NONE+++	387.2 DAYS	306.0
19	+++NONE+++	366.5 DAYS	324.0
20	+++NONE+++	384.2 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
--	-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	385.8 DAYS	0.0
2	+++NONE+++	397.1 DAYS	18.0
3	+++NONE+++	389.2 DAYS	36.0
4	+++NONE+++	377.6 DAYS	54.0
5	+++NONE+++	372.9 DAYS	72.0
6	+++NONE+++	372.3 DAYS	90.0
7	+++NONE+++	375.0 DAYS	108.0
8	+++NONE+++	381.4 DAYS	126.0
9	+++NONE+++	393.0 DAYS	144.0
10	+++NONE+++	399.5 DAYS	162.0
11	+++NONE+++	379.8 DAYS	180.0
12	+++NONE+++	377.7 DAYS	198.0
13	+++NONE+++	365.2 DAYS	216.0
14	+++NONE+++	389.6 DAYS	234.0
15	+++NONE+++	387.4 DAYS	252.0
16	+++NONE+++	387.8 DAYS	270.0
17	+++NONE+++	390.1 DAYS	288.0
18	+++NONE+++	395.1 DAYS	306.0
19	+++NONE+++	373.9 DAYS	324.0
20	+++NONE+++	391.5 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
--	-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	393.2 DAYS	0.0
2	+++NONE+++	385.3 DAYS	18.0
3	+++NONE+++	378.7 DAYS	36.0
4	+++NONE+++	367.7 DAYS	54.0
5	+++NONE+++	398.8 DAYS	72.0

6	+++NONE+++	398.3 DAYS	90.0
7	+++NONE+++	400.9 DAYS	108.0
8	+++NONE+++	370.9 DAYS	126.0
9	+++NONE+++	382.3 DAYS	144.0
10	+++NONE+++	388.3 DAYS	162.0
11	+++NONE+++	393.0 DAYS	180.0
12	+++NONE+++	386.8 DAYS	198.0
13	+++NONE+++	373.2 DAYS	216.0
14	+++NONE+++	366.5 DAYS	234.0
15	+++NONE+++	394.7 DAYS	252.0
16	+++NONE+++	394.7 DAYS	270.0
17	+++NONE+++	365.9 DAYS	288.0
18	+++NONE+++	370.7 DAYS	306.0
19	+++NONE+++	379.9 DAYS	324.0
20	+++NONE+++	366.9 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	386.1 DAYS	0.0
2	+++NONE+++	376.0 DAYS	18.0
3	+++NONE+++	370.4 DAYS	36.0
4	+++NONE+++	394.9 DAYS	54.0
5	+++NONE+++	390.5 DAYS	72.0
6	+++NONE+++	389.8 DAYS	90.0
7	+++NONE+++	392.3 DAYS	108.0
8	+++NONE+++	398.2 DAYS	126.0
9	+++NONE+++	374.3 DAYS	144.0
10	+++NONE+++	380.1 DAYS	162.0
11	+++NONE+++	374.9 DAYS	180.0
12	+++NONE+++	394.7 DAYS	198.0
13	+++NONE+++	379.9 DAYS	216.0
14	+++NONE+++	372.6 DAYS	234.0
15	+++NONE+++	369.5 DAYS	252.0
16	+++NONE+++	369.1 DAYS	270.0
17	+++NONE+++	371.0 DAYS	288.0
18	+++NONE+++	375.7 DAYS	306.0
19	+++NONE+++	384.8 DAYS	324.0
20	+++NONE+++	371.1 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF	WELL	TIME OF	ANGLE BETA
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STREAMLINE REACHED ARRIVAL IN DEGREES

1	+++NONE+++	371.4 DAYS	0.0
2	+++NONE+++	368.4 DAYS	18.0
3	+++NONE+++	397.9 DAYS	36.0
4	+++NONE+++	388.1 DAYS	54.0
5	+++NONE+++	383.8 DAYS	72.0
6	+++NONE+++	383.1 DAYS	90.0
7	+++NONE+++	385.5 DAYS	108.0
8	+++NONE+++	391.3 DAYS	126.0
9	+++NONE+++	368.1 DAYS	144.0
10	+++NONE+++	373.9 DAYS	162.0
11	+++NONE+++	394.3 DAYS	180.0
12	+++NONE+++	370.6 DAYS	198.0
13	+++NONE+++	385.5 DAYS	216.0
14	+++NONE+++	377.6 DAYS	234.0
15	+++NONE+++	374.2 DAYS	252.0
16	+++NONE+++	373.5 DAYS	270.0
17	+++NONE+++	375.2 DAYS	288.0
18	+++NONE+++	379.8 DAYS	306.0
19	+++NONE+++	388.6 DAYS	324.0
20	+++NONE+++	374.4 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF WELL TIME OF ANGLE BETA
STREAMLINE REACHED ARRIVAL IN DEGREES

1	+++NONE+++	377.5 DAYS	0.0
2	+++NONE+++	395.5 DAYS	18.0
3	+++NONE+++	391.8 DAYS	36.0
4	+++NONE+++	382.4 DAYS	54.0
5	+++NONE+++	378.3 DAYS	72.0
6	+++NONE+++	377.7 DAYS	90.0
7	+++NONE+++	380.0 DAYS	108.0
8	+++NONE+++	385.8 DAYS	126.0
9	+++NONE+++	397.1 DAYS	144.0
10	+++NONE+++	369.0 DAYS	162.0
11	+++NONE+++	374.2 DAYS	180.0
12	+++NONE+++	376.0 DAYS	198.0
13	+++NONE+++	390.2 DAYS	216.0
14	+++NONE+++	381.8 DAYS	234.0
15	+++NONE+++	378.0 DAYS	252.0
16	+++NONE+++	377.1 DAYS	270.0
17	+++NONE+++	378.6 DAYS	288.0

18	+++NONE+++	382.9 DAYS	306.0
19	+++NONE+++	391.6 DAYS	324.0
20	+++NONE+++	376.8 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	383.9 DAYS	0.0
2	+++NONE+++	389.6 DAYS	18.0
3	+++NONE+++	386.6 DAYS	36.0
4	+++NONE+++	377.6 DAYS	54.0
5	+++NONE+++	373.7 DAYS	72.0
6	+++NONE+++	373.1 DAYS	90.0
7	+++NONE+++	375.4 DAYS	108.0
8	+++NONE+++	381.2 DAYS	126.0
9	+++NONE+++	392.6 DAYS	144.0
10	+++NONE+++	365.1 DAYS	162.0
11	+++NONE+++	383.4 DAYS	180.0
12	+++NONE+++	380.7 DAYS	198.0
13	+++NONE+++	394.1 DAYS	216.0
14	+++NONE+++	385.1 DAYS	234.0
15	+++NONE+++	381.0 DAYS	252.0
16	+++NONE+++	379.9 DAYS	270.0
17	+++NONE+++	381.2 DAYS	288.0
18	+++NONE+++	385.4 DAYS	306.0
19	+++NONE+++	393.8 DAYS	324.0
20	+++NONE+++	378.5 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	367.2 DAYS	0.0
2	+++NONE+++	384.3 DAYS	18.0
3	+++NONE+++	381.9 DAYS	36.0
4	+++NONE+++	373.4 DAYS	54.0
5	+++NONE+++	369.6 DAYS	72.0
6	+++NONE+++	369.1 DAYS	90.0
7	+++NONE+++	371.4 DAYS	108.0
8	+++NONE+++	377.2 DAYS	126.0
9	+++NONE+++	388.7 DAYS	144.0
10	+++NONE+++	395.0 DAYS	162.0

11	+++NONE+++	392.7 DAYS	180.0
12	+++NONE+++	369.1 DAYS	198.0
13	+++NONE+++	365.5 DAYS	216.0
14	+++NONE+++	387.8 DAYS	234.0
15	+++NONE+++	383.3 DAYS	252.0
16	+++NONE+++	382.0 DAYS	270.0
17	+++NONE+++	383.1 DAYS	288.0
18	+++NONE+++	387.1 DAYS	306.0
19	+++NONE+++	395.4 DAYS	324.0
20	+++NONE+++	379.5 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE REACHED	WELL	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
--	---------------------------------	------	--------------------	--------------------------

1	+++NONE+++	374.4 DAYS	0.0
2	+++NONE+++	394.3 DAYS	18.0
3	+++NONE+++	377.8 DAYS	36.0
4	+++NONE+++	369.5 DAYS	54.0
5	+++NONE+++	365.9 DAYS	72.0
6	+++NONE+++	365.5 DAYS	90.0
7	+++NONE+++	367.8 DAYS	108.0
8	+++NONE+++	373.7 DAYS	126.0
9	+++NONE+++	385.4 DAYS	144.0
10	+++NONE+++	392.0 DAYS	162.0
11	+++NONE+++	376.4 DAYS	180.0
12	+++NONE+++	372.2 DAYS	198.0
13	+++NONE+++	367.9 DAYS	216.0
14	+++NONE+++	389.8 DAYS	234.0
15	+++NONE+++	385.0 DAYS	252.0
16	+++NONE+++	383.5 DAYS	270.0
17	+++NONE+++	384.5 DAYS	288.0
18	+++NONE+++	388.3 DAYS	306.0
19	+++NONE+++	396.3 DAYS	324.0
20	+++NONE+++	379.9 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE REACHED	WELL	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
--	---------------------------------	------	--------------------	--------------------------

1	+++NONE+++	386.6 DAYS	0.0
2	+++NONE+++	389.7 DAYS	18.0
3	+++NONE+++	373.9 DAYS	36.0

4	+++NONE+++	366.0 DAYS	54.0
5	+++NONE+++	395.1 DAYS	72.0
6	+++NONE+++	394.8 DAYS	90.0
7	+++NONE+++	397.3 DAYS	108.0
8	+++NONE+++	370.6 DAYS	126.0
9	+++NONE+++	382.4 DAYS	144.0
10	+++NONE+++	389.4 DAYS	162.0
11	+++NONE+++	386.0 DAYS	180.0
12	+++NONE+++	374.9 DAYS	198.0
13	+++NONE+++	369.7 DAYS	216.0
14	+++NONE+++	391.2 DAYS	234.0
15	+++NONE+++	386.2 DAYS	252.0
16	+++NONE+++	384.5 DAYS	270.0
17	+++NONE+++	385.3 DAYS	288.0
18	+++NONE+++	388.9 DAYS	306.0
19	+++NONE+++	396.6 DAYS	324.0
20	+++NONE+++	379.8 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	394.3 DAYS	0.0
2	+++NONE+++	385.4 DAYS	18.0
3	+++NONE+++	370.2 DAYS	36.0
4	+++NONE+++	394.9 DAYS	54.0
5	+++NONE+++	391.7 DAYS	72.0
6	+++NONE+++	391.5 DAYS	90.0
7	+++NONE+++	394.0 DAYS	108.0
8	+++NONE+++	367.6 DAYS	126.0
9	+++NONE+++	379.6 DAYS	144.0
10	+++NONE+++	387.1 DAYS	162.0
11	+++NONE+++	365.5 DAYS	180.0
12	+++NONE+++	377.0 DAYS	198.0
13	+++NONE+++	371.0 DAYS	216.0
14	+++NONE+++	392.1 DAYS	234.0
15	+++NONE+++	386.9 DAYS	252.0
16	+++NONE+++	384.9 DAYS	270.0
17	+++NONE+++	385.6 DAYS	288.0
18	+++NONE+++	389.0 DAYS	306.0
19	+++NONE+++	396.5 DAYS	324.0
20	+++NONE+++	379.3 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	379.6 DAYS	0.0
2	+++NONE+++	381.2 DAYS	18.0
3	+++NONE+++	366.6 DAYS	36.0
4	+++NONE+++	391.3 DAYS	54.0
5	+++NONE+++	388.3 DAYS	72.0
6	+++NONE+++	388.2 DAYS	90.0
7	+++NONE+++	390.8 DAYS	108.0
8	+++NONE+++	396.9 DAYS	126.0
9	+++NONE+++	377.0 DAYS	144.0
10	+++NONE+++	385.0 DAYS	162.0
11	+++NONE+++	380.6 DAYS	180.0
12	+++NONE+++	378.7 DAYS	198.0
13	+++NONE+++	371.8 DAYS	216.0
14	+++NONE+++	392.5 DAYS	234.0
15	+++NONE+++	387.0 DAYS	252.0
16	+++NONE+++	384.9 DAYS	270.0
17	+++NONE+++	385.4 DAYS	288.0
18	+++NONE+++	388.6 DAYS	306.0
19	+++NONE+++	395.8 DAYS	324.0
20	+++NONE+++	378.3 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	371.7 DAYS	0.0
2	+++NONE+++	377.2 DAYS	18.0
3	+++NONE+++	394.7 DAYS	36.0
4	+++NONE+++	387.9 DAYS	54.0
5	+++NONE+++	385.1 DAYS	72.0
6	+++NONE+++	385.1 DAYS	90.0
7	+++NONE+++	387.8 DAYS	108.0
8	+++NONE+++	393.9 DAYS	126.0
9	+++NONE+++	374.5 DAYS	144.0
10	+++NONE+++	383.1 DAYS	162.0
11	+++NONE+++	371.2 DAYS	180.0
12	+++NONE+++	380.1 DAYS	198.0
13	+++NONE+++	372.3 DAYS	216.0
14	+++NONE+++	392.5 DAYS	234.0
15	+++NONE+++	386.8 DAYS	252.0
16	+++NONE+++	384.5 DAYS	270.0

17	+++NONE+++	384.8 DAYS	288.0
18	+++NONE+++	387.9 DAYS	306.0
19	+++NONE+++	394.8 DAYS	324.0
20	+++NONE+++	376.9 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	381.2 DAYS	0.0
2	+++NONE+++	373.2 DAYS	18.0
3	+++NONE+++	391.0 DAYS	36.0
4	+++NONE+++	384.5 DAYS	54.0
5	+++NONE+++	381.8 DAYS	72.0
6	+++NONE+++	381.9 DAYS	90.0
7	+++NONE+++	384.7 DAYS	108.0
8	+++NONE+++	391.0 DAYS	126.0
9	+++NONE+++	372.0 DAYS	144.0
10	+++NONE+++	381.3 DAYS	162.0
11	+++NONE+++	371.5 DAYS	180.0
12	+++NONE+++	381.0 DAYS	198.0
13	+++NONE+++	372.3 DAYS	216.0
14	+++NONE+++	392.0 DAYS	234.0
15	+++NONE+++	386.1 DAYS	252.0
16	+++NONE+++	383.7 DAYS	270.0
17	+++NONE+++	383.8 DAYS	288.0
18	+++NONE+++	386.7 DAYS	306.0
19	+++NONE+++	393.3 DAYS	324.0
20	+++NONE+++	375.1 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	369.6 DAYS	0.0
2	+++NONE+++	369.1 DAYS	18.0
3	+++NONE+++	387.2 DAYS	36.0
4	+++NONE+++	381.0 DAYS	54.0
5	+++NONE+++	378.5 DAYS	72.0
6	+++NONE+++	378.8 DAYS	90.0
7	+++NONE+++	381.6 DAYS	108.0
8	+++NONE+++	388.0 DAYS	126.0
9	+++NONE+++	369.5 DAYS	144.0

10	+++NONE+++	379.5 DAYS	162.0
11	+++NONE+++	385.4 DAYS	180.0
12	+++NONE+++	381.7 DAYS	198.0
13	+++NONE+++	372.0 DAYS	216.0
14	+++NONE+++	391.2 DAYS	234.0
15	+++NONE+++	385.1 DAYS	252.0
16	+++NONE+++	382.4 DAYS	270.0
17	+++NONE+++	382.4 DAYS	288.0
18	+++NONE+++	385.1 DAYS	306.0
19	+++NONE+++	391.4 DAYS	324.0
20	+++NONE+++	372.9 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	380.7 DAYS	0.0
2	+++NONE+++	365.1 DAYS	18.0
3	+++NONE+++	383.4 DAYS	36.0
4	+++NONE+++	377.5 DAYS	54.0
5	+++NONE+++	375.2 DAYS	72.0
6	+++NONE+++	375.5 DAYS	90.0
7	+++NONE+++	378.5 DAYS	108.0
8	+++NONE+++	385.0 DAYS	126.0
9	+++NONE+++	366.9 DAYS	144.0
10	+++NONE+++	377.8 DAYS	162.0
11	+++NONE+++	390.7 DAYS	180.0
12	+++NONE+++	382.1 DAYS	198.0
13	+++NONE+++	371.2 DAYS	216.0
14	+++NONE+++	389.9 DAYS	234.0
15	+++NONE+++	383.6 DAYS	252.0
16	+++NONE+++	380.8 DAYS	270.0
17	+++NONE+++	380.6 DAYS	288.0
18	+++NONE+++	383.1 DAYS	306.0
19	+++NONE+++	389.2 DAYS	324.0
20	+++NONE+++	370.4 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	387.3 DAYS	0.0
2	+++NONE+++	391.3 DAYS	18.0

3	+++NONE+++	379.5 DAYS	36.0
4	+++NONE+++	373.9 DAYS	54.0
5	+++NONE+++	371.7 DAYS	72.0
6	+++NONE+++	372.2 DAYS	90.0
7	+++NONE+++	375.3 DAYS	108.0
8	+++NONE+++	381.8 DAYS	126.0
9	+++NONE+++	395.0 DAYS	144.0
10	+++NONE+++	376.1 DAYS	162.0
11	+++NONE+++	376.3 DAYS	180.0
12	+++NONE+++	382.1 DAYS	198.0
13	+++NONE+++	370.1 DAYS	216.0
14	+++NONE+++	388.3 DAYS	234.0
15	+++NONE+++	381.8 DAYS	252.0
16	+++NONE+++	378.9 DAYS	270.0
17	+++NONE+++	378.5 DAYS	288.0
18	+++NONE+++	380.7 DAYS	306.0
19	+++NONE+++	386.5 DAYS	324.0
20	+++NONE+++	367.5 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	376.3 DAYS	0.0
2	+++NONE+++	386.7 DAYS	18.0
3	+++NONE+++	375.4 DAYS	36.0
4	+++NONE+++	370.1 DAYS	54.0
5	+++NONE+++	368.2 DAYS	72.0
6	+++NONE+++	368.8 DAYS	90.0
7	+++NONE+++	371.9 DAYS	108.0
8	+++NONE+++	378.6 DAYS	126.0
9	+++NONE+++	391.9 DAYS	144.0
10	+++NONE+++	374.3 DAYS	162.0
11	+++NONE+++	365.4 DAYS	180.0
12	+++NONE+++	381.9 DAYS	198.0
13	+++NONE+++	368.7 DAYS	216.0
14	+++NONE+++	386.3 DAYS	234.0
15	+++NONE+++	379.6 DAYS	252.0
16	+++NONE+++	376.5 DAYS	270.0
17	+++NONE+++	376.0 DAYS	288.0
18	+++NONE+++	378.0 DAYS	306.0
19	+++NONE+++	383.5 DAYS	324.0
20	+++NONE+++	395.1 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	366.8 DAYS	0.0
2	+++NONE+++	382.0 DAYS	18.0
3	+++NONE+++	371.2 DAYS	36.0
4	+++NONE+++	366.2 DAYS	54.0
5	+++NONE+++	394.6 DAYS	72.0
6	+++NONE+++	365.2 DAYS	90.0
7	+++NONE+++	368.4 DAYS	108.0
8	+++NONE+++	375.1 DAYS	126.0
9	+++NONE+++	388.7 DAYS	144.0
10	+++NONE+++	388.7 DAYS	162.0
11	+++NONE+++	391.6 DAYS	180.0
12	+++NONE+++	381.4 DAYS	198.0
13	+++NONE+++	366.8 DAYS	216.0
14	+++NONE+++	383.9 DAYS	234.0
15	+++NONE+++	377.0 DAYS	252.0
16	+++NONE+++	373.8 DAYS	270.0
17	+++NONE+++	373.1 DAYS	288.0
18	+++NONE+++	374.9 DAYS	306.0
19	+++NONE+++	380.0 DAYS	324.0
20	+++NONE+++	391.3 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	384.1 DAYS	0.0
2	+++NONE+++	377.1 DAYS	18.0
3	+++NONE+++	366.7 DAYS	36.0
4	+++NONE+++	391.8 DAYS	54.0
5	+++NONE+++	390.4 DAYS	72.0
6	+++NONE+++	391.3 DAYS	90.0
7	+++NONE+++	394.7 DAYS	108.0
8	+++NONE+++	371.5 DAYS	126.0
9	+++NONE+++	385.3 DAYS	144.0
10	+++NONE+++	386.6 DAYS	162.0
11	+++NONE+++	385.0 DAYS	180.0
12	+++NONE+++	380.7 DAYS	198.0
13	+++NONE+++	395.3 DAYS	216.0
14	+++NONE+++	381.0 DAYS	234.0

15	+++NONE+++	374.0 DAYS	252.0
16	+++NONE+++	370.6 DAYS	270.0
17	+++NONE+++	369.8 DAYS	288.0
18	+++NONE+++	371.4 DAYS	306.0
19	+++NONE+++	376.2 DAYS	324.0
20	+++NONE+++	386.9 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	380.5 DAYS	0.0
2	+++NONE+++	371.9 DAYS	18.0
3	+++NONE+++	391.4 DAYS	36.0
4	+++NONE+++	387.1 DAYS	54.0
5	+++NONE+++	385.9 DAYS	72.0
6	+++NONE+++	387.0 DAYS	90.0
7	+++NONE+++	390.4 DAYS	108.0
8	+++NONE+++	367.7 DAYS	126.0
9	+++NONE+++	381.6 DAYS	144.0
10	+++NONE+++	384.3 DAYS	162.0
11	+++NONE+++	387.6 DAYS	180.0
12	+++NONE+++	366.0 DAYS	198.0
13	+++NONE+++	392.4 DAYS	216.0
14	+++NONE+++	377.8 DAYS	234.0
15	+++NONE+++	370.6 DAYS	252.0
16	+++NONE+++	367.1 DAYS	270.0
17	+++NONE+++	366.1 DAYS	288.0
18	+++NONE+++	367.4 DAYS	306.0
19	+++NONE+++	371.9 DAYS	324.0
20	+++NONE+++	382.2 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	372.3 DAYS	0.0
2	+++NONE+++	366.4 DAYS	18.0
3	+++NONE+++	386.0 DAYS	36.0
4	+++NONE+++	382.1 DAYS	54.0
5	+++NONE+++	381.1 DAYS	72.0
6	+++NONE+++	382.3 DAYS	90.0
7	+++NONE+++	385.9 DAYS	108.0

8	+++NONE+++	392.9 DAYS	126.0
9	+++NONE+++	377.6 DAYS	144.0
10	+++NONE+++	381.8 DAYS	162.0
11	+++NONE+++	390.4 DAYS	180.0
12	+++NONE+++	394.6 DAYS	198.0
13	+++NONE+++	388.9 DAYS	216.0
14	+++NONE+++	374.1 DAYS	234.0
15	+++NONE+++	366.8 DAYS	252.0
16	+++NONE+++	393.4 DAYS	270.0
17	+++NONE+++	392.1 DAYS	288.0
18	+++NONE+++	393.1 DAYS	306.0
19	+++NONE+++	367.2 DAYS	324.0
20	+++NONE+++	377.0 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
--	-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	391.9 DAYS	0.0
2	+++NONE+++	389.0 DAYS	18.0
3	+++NONE+++	380.3 DAYS	36.0
4	+++NONE+++	376.7 DAYS	54.0
5	+++NONE+++	375.9 DAYS	72.0
6	+++NONE+++	377.3 DAYS	90.0
7	+++NONE+++	381.0 DAYS	108.0
8	+++NONE+++	388.1 DAYS	126.0
9	+++NONE+++	373.4 DAYS	144.0
10	+++NONE+++	379.1 DAYS	162.0
11	+++NONE+++	369.9 DAYS	180.0
12	+++NONE+++	392.6 DAYS	198.0
13	+++NONE+++	385.0 DAYS	216.0
14	+++NONE+++	369.9 DAYS	234.0
15	+++NONE+++	392.4 DAYS	252.0
16	+++NONE+++	388.5 DAYS	270.0
17	+++NONE+++	387.1 DAYS	288.0
18	+++NONE+++	387.8 DAYS	306.0
19	+++NONE+++	391.5 DAYS	324.0
20	+++NONE+++	371.2 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
--	-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	383.0 DAYS	0.0
2	+++NONE+++	382.3 DAYS	18.0
3	+++NONE+++	374.2 DAYS	36.0
4	+++NONE+++	370.9 DAYS	54.0
5	+++NONE+++	370.4 DAYS	72.0
6	+++NONE+++	371.9 DAYS	90.0
7	+++NONE+++	375.7 DAYS	108.0
8	+++NONE+++	382.9 DAYS	126.0
9	+++NONE+++	368.7 DAYS	144.0
10	+++NONE+++	375.9 DAYS	162.0
11	+++NONE+++	379.2 DAYS	180.0
12	+++NONE+++	390.2 DAYS	198.0
13	+++NONE+++	380.5 DAYS	216.0
14	+++NONE+++	365.2 DAYS	234.0
15	+++NONE+++	387.1 DAYS	252.0
16	+++NONE+++	383.2 DAYS	270.0
17	+++NONE+++	381.5 DAYS	288.0
18	+++NONE+++	382.0 DAYS	306.0
19	+++NONE+++	385.3 DAYS	324.0
20	+++NONE+++	393.8 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	373.7 DAYS	0.0
2	+++NONE+++	375.0 DAYS	18.0
3	+++NONE+++	367.6 DAYS	36.0
4	+++NONE+++	392.7 DAYS	54.0
5	+++NONE+++	392.5 DAYS	72.0
6	+++NONE+++	366.1 DAYS	90.0
7	+++NONE+++	370.0 DAYS	108.0
8	+++NONE+++	377.2 DAYS	126.0
9	+++NONE+++	391.6 DAYS	144.0
10	+++NONE+++	372.2 DAYS	162.0
11	+++NONE+++	374.7 DAYS	180.0
12	+++NONE+++	387.1 DAYS	198.0
13	+++NONE+++	375.4 DAYS	216.0
14	+++NONE+++	388.9 DAYS	234.0
15	+++NONE+++	381.3 DAYS	252.0
16	+++NONE+++	377.2 DAYS	270.0
17	+++NONE+++	375.3 DAYS	288.0
18	+++NONE+++	375.5 DAYS	306.0
19	+++NONE+++	378.4 DAYS	324.0

20 +++NONE+++ 386.3 DAYS 342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	390.6 DAYS	0.0
2	+++NONE+++	367.2 DAYS	18.0
3	+++NONE+++	387.7 DAYS	36.0
4	+++NONE+++	385.4 DAYS	54.0
5	+++NONE+++	385.5 DAYS	72.0
6	+++NONE+++	387.5 DAYS	90.0
7	+++NONE+++	391.6 DAYS	108.0
8	+++NONE+++	371.0 DAYS	126.0
9	+++NONE+++	385.4 DAYS	144.0
10	+++NONE+++	367.8 DAYS	162.0
11	+++NONE+++	385.4 DAYS	180.0
12	+++NONE+++	383.1 DAYS	198.0
13	+++NONE+++	369.5 DAYS	216.0
14	+++NONE+++	382.5 DAYS	234.0
15	+++NONE+++	374.7 DAYS	252.0
16	+++NONE+++	370.5 DAYS	270.0
17	+++NONE+++	368.4 DAYS	288.0
18	+++NONE+++	368.3 DAYS	306.0
19	+++NONE+++	370.7 DAYS	324.0
20	+++NONE+++	378.0 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	383.9 DAYS	0.0
2	+++NONE+++	385.1 DAYS	18.0
3	+++NONE+++	379.2 DAYS	36.0
4	+++NONE+++	377.3 DAYS	54.0
5	+++NONE+++	377.8 DAYS	72.0
6	+++NONE+++	380.0 DAYS	90.0
7	+++NONE+++	384.2 DAYS	108.0
8	+++NONE+++	391.5 DAYS	126.0
9	+++NONE+++	378.4 DAYS	144.0
10	+++NONE+++	389.3 DAYS	162.0
11	+++NONE+++	372.1 DAYS	180.0
12	+++NONE+++	378.0 DAYS	198.0

13	+++NONE+++	390.6 DAYS	216.0
14	+++NONE+++	375.2 DAYS	234.0
15	+++NONE+++	367.4 DAYS	252.0
16	+++NONE+++	391.0 DAYS	270.0
17	+++NONE+++	388.6 DAYS	288.0
18	+++NONE+++	388.0 DAYS	306.0
19	+++NONE+++	389.7 DAYS	324.0
20	+++NONE+++	368.7 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	371.5 DAYS	0.0
2	+++NONE+++	374.9 DAYS	18.0
3	+++NONE+++	369.8 DAYS	36.0
4	+++NONE+++	368.5 DAYS	54.0
5	+++NONE+++	369.3 DAYS	72.0
6	+++NONE+++	371.8 DAYS	90.0
7	+++NONE+++	376.0 DAYS	108.0
8	+++NONE+++	383.3 DAYS	126.0
9	+++NONE+++	370.6 DAYS	144.0
10	+++NONE+++	382.1 DAYS	162.0
11	+++NONE+++	564.5 DAYS	180.0
12	+++NONE+++	371.3 DAYS	198.0
13	+++NONE+++	382.2 DAYS	216.0
14	+++NONE+++	366.9 DAYS	234.0
15	+++NONE+++	386.6 DAYS	252.0
16	+++NONE+++	382.0 DAYS	270.0
17	+++NONE+++	379.3 DAYS	288.0
18	+++NONE+++	378.3 DAYS	306.0
19	+++NONE+++	379.5 DAYS	324.0
20	+++NONE+++	384.9 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	382.7 DAYS	0.0
2	+++NONE+++	389.2 DAYS	18.0
3	+++NONE+++	385.3 DAYS	36.0
4	+++NONE+++	384.8 DAYS	54.0
5	+++NONE+++	386.2 DAYS	72.0

6	+++NONE+++	389.1 DAYS	90.0
7	+++NONE+++	367.0 DAYS	108.0
8	+++NONE+++	374.2 DAYS	126.0
9	+++NONE+++	388.0 DAYS	144.0
10	+++NONE+++	373.2 DAYS	162.0
11	+++NONE+++	1303.5 DAYS	180.0
12	+++NONE+++	388.6 DAYS	198.0
13	+++NONE+++	372.5 DAYS	216.0
14	+++NONE+++	384.4 DAYS	234.0
15	+++NONE+++	376.6 DAYS	252.0
16	+++NONE+++	371.9 DAYS	270.0
17	+++NONE+++	368.9 DAYS	288.0
18	+++NONE+++	367.4 DAYS	306.0
19	+++NONE+++	367.9 DAYS	324.0
20	+++NONE+++	372.4 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	386.1 DAYS	0.0
2	+++NONE+++	376.2 DAYS	18.0
3	+++NONE+++	373.4 DAYS	36.0
4	+++NONE+++	373.6 DAYS	54.0
5	+++NONE+++	375.5 DAYS	72.0
6	+++NONE+++	378.6 DAYS	90.0
7	+++NONE+++	383.2 DAYS	108.0
8	+++NONE+++	390.2 DAYS	126.0
9	+++NONE+++	377.3 DAYS	144.0
10	+++NONE+++	387.0 DAYS	162.0
11	+++NONE+++	380.3 DAYS	180.0
12	+++NONE+++	375.9 DAYS	198.0
13	+++NONE+++	387.4 DAYS	216.0
14	+++NONE+++	373.0 DAYS	234.0
15	+++NONE+++	365.4 DAYS	252.0
16	+++NONE+++	387.1 DAYS	270.0
17	+++NONE+++	383.7 DAYS	288.0
18	+++NONE+++	381.5 DAYS	306.0
19	+++NONE+++	381.0 DAYS	324.0
20	+++NONE+++	383.9 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF	WELL	TIME OF	ANGLE BETA
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STREAMLINE REACHED ARRIVAL IN DEGREES

1	+++NONE+++	375.1 DAYS	0.0
2	+++NONE+++	389.0 DAYS	18.0
3	+++NONE+++	387.8 DAYS	36.0
4	+++NONE+++	389.1 DAYS	54.0
5	+++NONE+++	391.5 DAYS	72.0
6	+++NONE+++	368.2 DAYS	90.0
7	+++NONE+++	372.5 DAYS	108.0
8	+++NONE+++	379.1 DAYS	126.0
9	+++NONE+++	365.4 DAYS	144.0
10	+++NONE+++	372.0 DAYS	162.0
11	+++NONE+++	383.0 DAYS	180.0
12	+++NONE+++	384.4 DAYS	198.0
13	+++NONE+++	373.9 DAYS	216.0
14	+++NONE+++	386.9 DAYS	234.0
15	+++NONE+++	379.8 DAYS	252.0
16	+++NONE+++	375.0 DAYS	270.0
17	+++NONE+++	371.3 DAYS	288.0
18	+++NONE+++	368.6 DAYS	306.0
19	+++NONE+++	367.3 DAYS	324.0
20	+++NONE+++	368.7 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF WELL TIME OF ANGLE BETA
STREAMLINE REACHED ARRIVAL IN DEGREES

1	+++NONE+++	383.2 DAYS	0.0
2	+++NONE+++	381.4 DAYS	18.0
3	+++NONE+++	381.2 DAYS	36.0
4	+++NONE+++	382.8 DAYS	54.0
5	+++NONE+++	385.1 DAYS	72.0
6	+++NONE+++	387.9 DAYS	90.0
7	+++NONE+++	391.5 DAYS	108.0
8	+++NONE+++	369.6 DAYS	126.0
9	+++NONE+++	380.0 DAYS	144.0
10	+++NONE+++	379.9 DAYS	162.0
11	+++NONE+++	385.8 DAYS	180.0
12	+++NONE+++	389.4 DAYS	198.0
13	+++NONE+++	386.8 DAYS	216.0
14	+++NONE+++	375.5 DAYS	234.0
15	+++NONE+++	369.5 DAYS	252.0
16	+++NONE+++	365.3 DAYS	270.0
17	+++NONE+++	390.0 DAYS	288.0

18	+++NONE+++	387.3 DAYS	306.0
19	+++NONE+++	385.4 DAYS	324.0
20	+++NONE+++	385.4 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	382.9 DAYS	0.0
2	+++NONE+++	388.4 DAYS	18.0
3	+++NONE+++	388.4 DAYS	36.0
4	+++NONE+++	389.2 DAYS	54.0
5	+++NONE+++	390.3 DAYS	72.0
6	+++NONE+++	391.5 DAYS	90.0
7	+++NONE+++	393.4 DAYS	108.0
8	+++NONE+++	367.7 DAYS	126.0
9	+++NONE+++	375.2 DAYS	144.0
10	+++NONE+++	365.5 DAYS	162.0
11	+++NONE+++	379.7 DAYS	180.0
12	+++NONE+++	371.5 DAYS	198.0
13	+++NONE+++	379.9 DAYS	216.0
14	+++NONE+++	371.8 DAYS	234.0
15	+++NONE+++	367.8 DAYS	252.0
16	+++NONE+++	365.4 DAYS	270.0
17	+++NONE+++	393.5 DAYS	288.0
18	+++NONE+++	392.1 DAYS	306.0
19	+++NONE+++	391.0 DAYS	324.0
20	+++NONE+++	390.8 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	389.7 DAYS	0.0
2	+++NONE+++	389.2 DAYS	18.0
3	+++NONE+++	388.2 DAYS	36.0
4	+++NONE+++	386.9 DAYS	54.0
5	+++NONE+++	385.4 DAYS	72.0
6	+++NONE+++	383.9 DAYS	90.0
7	+++NONE+++	383.0 DAYS	108.0
8	+++NONE+++	383.4 DAYS	126.0
9	+++NONE+++	386.6 DAYS	144.0
10	+++NONE+++	394.7 DAYS	162.0

11	+++NONE+++	378.2 DAYS	180.0
12	+++NONE+++	367.4 DAYS	198.0
13	+++NONE+++	389.4 DAYS	216.0
14	+++NONE+++	385.9 DAYS	234.0
15	+++NONE+++	385.2 DAYS	252.0
16	+++NONE+++	385.9 DAYS	270.0
17	+++NONE+++	387.0 DAYS	288.0
18	+++NONE+++	388.2 DAYS	306.0
19	+++NONE+++	389.1 DAYS	324.0
20	+++NONE+++	389.6 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	376.8 DAYS	0.0
2	+++NONE+++	391.4 DAYS	18.0
3	+++NONE+++	372.3 DAYS	36.0
4	+++NONE+++	370.8 DAYS	54.0
5	+++NONE+++	381.3 DAYS	72.0
6	+++NONE+++	366.0 DAYS	90.0
7	+++NONE+++	387.2 DAYS	108.0
8	+++NONE+++	384.6 DAYS	126.0
9	+++NONE+++	384.2 DAYS	144.0
10	+++NONE+++	384.6 DAYS	162.0
11	+++NONE+++	385.2 DAYS	180.0
12	+++NONE+++	385.5 DAYS	198.0
13	+++NONE+++	385.5 DAYS	216.0
14	+++NONE+++	385.6 DAYS	234.0
15	+++NONE+++	386.1 DAYS	252.0
16	+++NONE+++	388.2 DAYS	270.0
17	+++NONE+++	393.1 DAYS	288.0
18	+++NONE+++	374.7 DAYS	306.0
19	+++NONE+++	366.6 DAYS	324.0
20	+++NONE+++	389.7 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	432.8 DAYS	0.0
2	+++NONE+++	399.7 DAYS	18.0
3	+++NONE+++	380.8 DAYS	36.0

4	+++NONE+++	380.8 DAYS	54.0
5	+++NONE+++	366.6 DAYS	72.0
6	+++NONE+++	366.5 DAYS	90.0
7	+++NONE+++	387.2 DAYS	108.0
8	+++NONE+++	384.0 DAYS	126.0
9	+++NONE+++	382.9 DAYS	144.0
10	+++NONE+++	382.7 DAYS	162.0
11	+++NONE+++	382.7 DAYS	180.0
12	+++NONE+++	382.7 DAYS	198.0
13	+++NONE+++	382.8 DAYS	216.0
14	+++NONE+++	383.6 DAYS	234.0
15	+++NONE+++	386.4 DAYS	252.0
16	+++NONE+++	365.4 DAYS	270.0
17	+++NONE+++	366.9 DAYS	288.0
18	+++NONE+++	370.3 DAYS	306.0
19	+++NONE+++	378.9 DAYS	324.0
20	+++NONE+++	443.5 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	391.8 DAYS	0.0
2	+++NONE+++	374.7 DAYS	18.0
3	+++NONE+++	374.1 DAYS	36.0
4	+++NONE+++	385.0 DAYS	54.0
5	+++NONE+++	367.9 DAYS	72.0
6	+++NONE+++	368.3 DAYS	90.0
7	+++NONE+++	389.2 DAYS	108.0
8	+++NONE+++	386.1 DAYS	126.0
9	+++NONE+++	385.0 DAYS	144.0
10	+++NONE+++	384.7 DAYS	162.0
11	+++NONE+++	384.7 DAYS	180.0
12	+++NONE+++	384.9 DAYS	198.0
13	+++NONE+++	385.5 DAYS	216.0
14	+++NONE+++	387.4 DAYS	234.0
15	+++NONE+++	392.4 DAYS	252.0
16	+++NONE+++	376.8 DAYS	270.0
17	+++NONE+++	390.9 DAYS	288.0
18	+++NONE+++	367.7 DAYS	306.0
19	+++NONE+++	408.8 DAYS	324.0
20	+++NONE+++	373.5 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	391.6 DAYS	0.0
2	+++NONE+++	378.9 DAYS	18.0
3	+++NONE+++	375.5 DAYS	36.0
4	+++NONE+++	386.9 DAYS	54.0
5	+++NONE+++	383.0 DAYS	72.0
6	+++NONE+++	369.3 DAYS	90.0
7	+++NONE+++	390.9 DAYS	108.0
8	+++NONE+++	388.2 DAYS	126.0
9	+++NONE+++	387.4 DAYS	144.0
10	+++NONE+++	387.3 DAYS	162.0
11	+++NONE+++	387.6 DAYS	180.0
12	+++NONE+++	388.1 DAYS	198.0
13	+++NONE+++	389.3 DAYS	216.0
14	+++NONE+++	392.1 DAYS	234.0
15	+++NONE+++	371.1 DAYS	252.0
16	+++NONE+++	388.9 DAYS	270.0
17	+++NONE+++	377.1 DAYS	288.0
18	+++NONE+++	411.3 DAYS	306.0
19	+++NONE+++	375.1 DAYS	324.0
20	+++NONE+++	374.6 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	396.7 DAYS	0.0
2	+++NONE+++	385.8 DAYS	18.0
3	+++NONE+++	380.9 DAYS	36.0
4	+++NONE+++	387.2 DAYS	54.0
5	+++NONE+++	382.9 DAYS	72.0
6	+++NONE+++	369.0 DAYS	90.0
7	+++NONE+++	391.7 DAYS	108.0
8	+++NONE+++	389.7 DAYS	126.0
9	+++NONE+++	389.3 DAYS	144.0
10	+++NONE+++	389.7 DAYS	162.0
11	+++NONE+++	390.3 DAYS	180.0
12	+++NONE+++	391.2 DAYS	198.0
13	+++NONE+++	392.8 DAYS	216.0
14	+++NONE+++	368.0 DAYS	234.0
15	+++NONE+++	377.0 DAYS	252.0
16	+++NONE+++	373.5 DAYS	270.0

17	+++NONE+++	378.7 DAYS	288.0
18	+++NONE+++	376.3 DAYS	306.0
19	+++NONE+++	380.3 DAYS	324.0
20	+++NONE+++	382.0 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	371.3 DAYS	0.0
2	+++NONE+++	388.9 DAYS	18.0
3	+++NONE+++	382.6 DAYS	36.0
4	+++NONE+++	383.1 DAYS	54.0
5	+++NONE+++	370.2 DAYS	72.0
6	+++NONE+++	367.7 DAYS	90.0
7	+++NONE+++	392.3 DAYS	108.0
8	+++NONE+++	391.2 DAYS	126.0
9	+++NONE+++	391.4 DAYS	144.0
10	+++NONE+++	392.1 DAYS	162.0
11	+++NONE+++	393.0 DAYS	180.0
12	+++NONE+++	394.1 DAYS	198.0
13	+++NONE+++	367.0 DAYS	216.0
14	+++NONE+++	371.3 DAYS	234.0
15	+++NONE+++	381.7 DAYS	252.0
16	+++NONE+++	384.3 DAYS	270.0
17	+++NONE+++	370.0 DAYS	288.0
18	+++NONE+++	391.5 DAYS	306.0
19	+++NONE+++	383.5 DAYS	324.0
20	+++NONE+++	386.5 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	377.7 DAYS	0.0
2	+++NONE+++	368.8 DAYS	18.0
3	+++NONE+++	390.3 DAYS	36.0
4	+++NONE+++	388.1 DAYS	54.0
5	+++NONE+++	370.1 DAYS	72.0
6	+++NONE+++	368.3 DAYS	90.0
7	+++NONE+++	365.6 DAYS	108.0
8	+++NONE+++	365.3 DAYS	126.0
9	+++NONE+++	365.8 DAYS	144.0

10	+++NONE+++	366.7 DAYS	162.0
11	+++NONE+++	367.5 DAYS	180.0
12	+++NONE+++	368.6 DAYS	198.0
13	+++NONE+++	370.5 DAYS	216.0
14	+++NONE+++	374.8 DAYS	234.0
15	+++NONE+++	385.8 DAYS	252.0
16	+++NONE+++	365.4 DAYS	270.0
17	+++NONE+++	525.8 DAYS	288.0
18	+++NONE+++	378.2 DAYS	306.0
19	+++NONE+++	382.7 DAYS	324.0
20	+++NONE+++	390.0 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	379.4 DAYS	0.0
2	+++NONE+++	374.0 DAYS	18.0
3	+++NONE+++	370.0 DAYS	36.0
4	+++NONE+++	368.2 DAYS	54.0
5	+++NONE+++	376.7 DAYS	72.0
6	+++NONE+++	379.0 DAYS	90.0
7	+++NONE+++	377.8 DAYS	108.0
8	+++NONE+++	377.9 DAYS	126.0
9	+++NONE+++	378.1 DAYS	144.0
10	+++NONE+++	378.3 DAYS	162.0
11	+++NONE+++	378.2 DAYS	180.0
12	+++NONE+++	378.3 DAYS	198.0
13	+++NONE+++	379.2 DAYS	216.0
14	+++NONE+++	382.6 DAYS	234.0
15	+++NONE+++	392.6 DAYS	252.0
16	+++NONE+++	366.6 DAYS	270.0
17	+++NONE+++	372.2 DAYS	288.0
18	+++NONE+++	370.0 DAYS	306.0
19	+++NONE+++	370.0 DAYS	324.0
20	+++NONE+++	386.9 DAYS	342.0

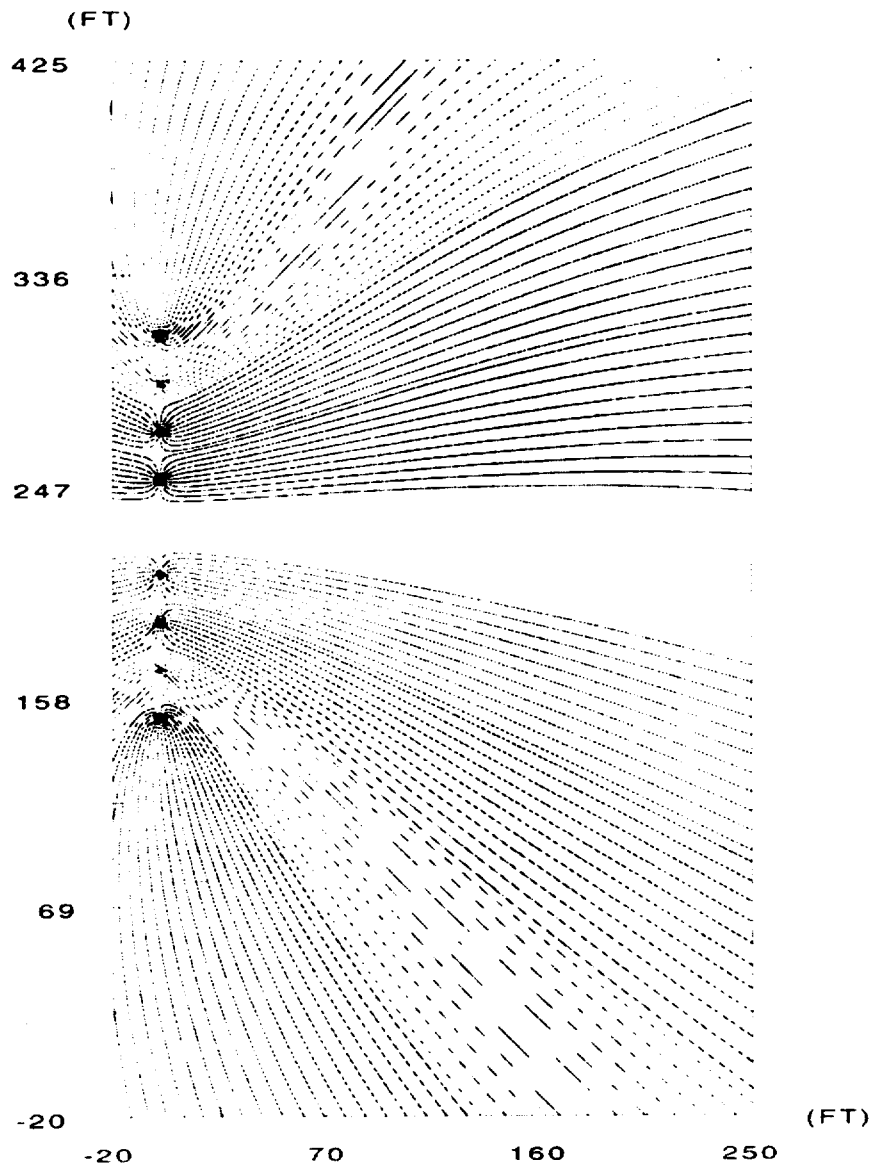
STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	386.0 DAYS	0.0
2	+++NONE+++	385.2 DAYS	18.0

3	+++NONE+++	384.9 DAYS	36.0
4	+++NONE+++	384.6 DAYS	54.0
5	+++NONE+++	384.2 DAYS	72.0
6	+++NONE+++	383.5 DAYS	90.0
7	+++NONE+++	382.3 DAYS	108.0
8	+++NONE+++	380.6 DAYS	126.0
9	+++NONE+++	378.5 DAYS	144.0
10	+++NONE+++	376.0 DAYS	162.0
11	+++NONE+++	373.5 DAYS	180.0
12	+++NONE+++	371.4 DAYS	198.0
13	+++NONE+++	370.2 DAYS	216.0
14	+++NONE+++	371.5 DAYS	234.0
15	+++NONE+++	378.1 DAYS	252.0
16	+++NONE+++	395.1 DAYS	270.0
17	+++NONE+++	393.5 DAYS	288.0
18	+++NONE+++	371.9 DAYS	306.0
19	+++NONE+++	392.8 DAYS	324.0
20	+++NONE+++	388.1 DAYS	342.0

AREA 11



Rockford FS - Area 11

FT AND DA SYSTEM OF UNITS IS USED
 REGIONAL FLOW, PORE VELOCITY = 0.08 FT/DAY
 ORIENTATION OF REGIONAL FLOW = 157.00 DEGREES
 THICKNESS OF THE AQUIFER = 101.00 FEET
 POROSITY = 25.00 PERCENT
 PERIOD STUDIED = 3650.00 DAYS
 INITIAL AQUIFER CONCENTRATION = 0.000E-01
 DEFAULT INJECTION CONCENTRATION = 0.000E-01
 STREAMLINE STEP LENGTH = 0.40 FEET
 ADSORPTION CAPACITY OF ROCK = 00.00 PERCENT

NUMBER OF INJECTION WELLS = 0
 NUMBER OF PUMPING WELLS = 9

1 9 PRODUCTION WELLS

WELL NAME	X FEET	Y FEET	FLOW-RATE FT3/DAY	RADIUS INDICATOR FEET
0.00	150.00	855.50	2.50E-01	0
0.00	170.00	855.50	2.50E-01	0
0.00	190.00	855.50	2.50E-01	0
0.00	210.00	855.50	2.50E-01	0
0.00	230.00	855.50	2.50E-01	0
0.00	250.00	855.50	2.50E-01	0
0.00	270.00	855.50	2.50E-01	0
0.00	290.00	855.50	2.50E-01	0
0.00	310.00	855.50	2.50E-01	0

40 gpm

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
1	+++NONE+++	3650.7 DAYS	0.0
2	+++NONE+++	3652.4 DAYS	18.0
3	+++NONE+++	3650.1 DAYS	36.0
4	+++NONE+++	3652.3 DAYS	54.0
5	+++NONE+++	3652.0 DAYS	72.0
6	+++NONE+++	3652.4 DAYS	90.0
7	+++NONE+++	3651.5 DAYS	108.0
8	+++NONE+++	3651.6 DAYS	126.0
9	+++NONE+++	3650.8 DAYS	144.0

10	+++NONE+++	3650.5 DAYS	162.0
11	+++NONE+++	3651.3 DAYS	180.0
12	+++NONE+++	3650.4 DAYS	198.0
13	+++NONE+++	3651.2 DAYS	216.0
14	+++NONE+++	3650.6 DAYS	234.0
15	+++NONE+++	3651.9 DAYS	252.0
16	+++NONE+++	3652.2 DAYS	270.0
17	+++NONE+++	3651.6 DAYS	288.0
18	+++NONE+++	3650.2 DAYS	306.0
19	+++NONE+++	3651.0 DAYS	324.0
20	+++NONE+++	3651.2 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	3652.5 DAYS	0.0
2	+++NONE+++	3650.6 DAYS	18.0
3	+++NONE+++	3650.1 DAYS	36.0
4	+++NONE+++	3650.7 DAYS	54.0
5	+++NONE+++	3651.5 DAYS	72.0
6	+++NONE+++	3650.4 DAYS	90.0
7	+++NONE+++	3650.7 DAYS	108.0
8	+++NONE+++	3652.5 DAYS	126.0
9	+++NONE+++	3650.7 DAYS	144.0
10	+++NONE+++	3652.8 DAYS	162.0
11	+++NONE+++	3650.2 DAYS	180.0
12	+++NONE+++	3652.3 DAYS	198.0
13	+++NONE+++	3650.1 DAYS	216.0
14	+++NONE+++	3652.5 DAYS	234.0
15	+++NONE+++	3652.7 DAYS	252.0
16	+++NONE+++	3652.1 DAYS	270.0
17	+++NONE+++	3652.7 DAYS	288.0
18	+++NONE+++	3650.6 DAYS	306.0
19	+++NONE+++	3652.6 DAYS	324.0
20	+++NONE+++	3650.3 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	3651.0 DAYS	0.0
2	+++NONE+++	3651.5 DAYS	18.0

3	+++NONE+++	3650.3 DAYS	36.0
4	+++NONE+++	3650.0 DAYS	54.0
5	+++NONE+++	3652.7 DAYS	72.0
6	+++NONE+++	3650.9 DAYS	90.0
7	+++NONE+++	3650.8 DAYS	108.0
8	+++NONE+++	3651.9 DAYS	126.0
9	+++NONE+++	3653.1 DAYS	144.0
10	+++NONE+++	3652.7 DAYS	162.0
11	+++NONE+++	3651.3 DAYS	180.0
12	+++NONE+++	3652.2 DAYS	198.0
13	+++NONE+++	3652.3 DAYS	216.0
14	+++NONE+++	3651.3 DAYS	234.0
15	+++NONE+++	3651.5 DAYS	252.0
16	+++NONE+++	3650.5 DAYS	270.0
17	+++NONE+++	3652.6 DAYS	288.0
18	+++NONE+++	3651.5 DAYS	306.0
19	+++NONE+++	3651.1 DAYS	324.0
20	+++NONE+++	3651.9 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
--	-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	3650.0 DAYS	0.0
2	+++NONE+++	3652.9 DAYS	18.0
3	+++NONE+++	3651.0 DAYS	36.0
4	+++NONE+++	3652.9 DAYS	54.0
5	+++NONE+++	3651.9 DAYS	72.0
6	+++NONE+++	3652.5 DAYS	90.0
7	+++NONE+++	3650.4 DAYS	108.0
8	+++NONE+++	3651.7 DAYS	126.0
9	+++NONE+++	3653.4 DAYS	144.0
10	+++NONE+++	3650.5 DAYS	162.0
11	+++NONE+++	3650.8 DAYS	180.0
12	+++NONE+++	3651.1 DAYS	198.0
13	+++NONE+++	3651.4 DAYS	216.0
14	+++NONE+++	3651.3 DAYS	234.0
15	+++NONE+++	3653.0 DAYS	252.0
16	+++NONE+++	3652.5 DAYS	270.0
17	+++NONE+++	3652.2 DAYS	288.0
18	+++NONE+++	3651.3 DAYS	306.0
19	+++NONE+++	3650.8 DAYS	324.0
20	+++NONE+++	3651.3 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	3650.3 DAYS	0.0
2	+++NONE+++	3652.7 DAYS	18.0
3	+++NONE+++	3650.5 DAYS	36.0
4	+++NONE+++	3651.9 DAYS	54.0
5	+++NONE+++	3650.6 DAYS	72.0
6	+++NONE+++	3651.3 DAYS	90.0
7	+++NONE+++	3654.9 DAYS	108.0
8	+++NONE+++	3653.3 DAYS	126.0
9	+++NONE+++	3654.8 DAYS	144.0
10	+++NONE+++	3650.1 DAYS	162.0
11	+++NONE+++	3651.3 DAYS	180.0
12	+++NONE+++	3650.7 DAYS	198.0
13	+++NONE+++	3653.1 DAYS	216.0
14	+++NONE+++	3650.4 DAYS	234.0
15	+++NONE+++	3653.1 DAYS	252.0
16	+++NONE+++	3651.2 DAYS	270.0
17	+++NONE+++	3650.9 DAYS	288.0
18	+++NONE+++	3652.7 DAYS	306.0
19	+++NONE+++	3651.9 DAYS	324.0
20	+++NONE+++	3652.0 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	3651.4 DAYS	0.0
2	+++NONE+++	3651.0 DAYS	18.0
3	+++NONE+++	3651.8 DAYS	36.0
4	+++NONE+++	3650.7 DAYS	54.0
5	+++NONE+++	3650.0 DAYS	72.0
6	+++NONE+++	3651.6 DAYS	90.0
7	+++NONE+++	3654.2 DAYS	108.0
8	+++NONE+++	3652.9 DAYS	126.0
9	+++NONE+++	3650.2 DAYS	144.0
10	+++NONE+++	3654.9 DAYS	162.0
11	+++NONE+++	3656.0 DAYS	180.0
12	+++NONE+++	3655.3 DAYS	198.0
13	+++NONE+++	3654.6 DAYS	216.0
14	+++NONE+++	3652.8 DAYS	234.0

15	+++NONE+++	3651.4 DAYS	252.0
16	+++NONE+++	3652.5 DAYS	270.0
17	+++NONE+++	3652.4 DAYS	288.0
18	+++NONE+++	3651.2 DAYS	306.0
19	+++NONE+++	3650.2 DAYS	324.0
20	+++NONE+++	3650.2 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	3652.8 DAYS	0.0
2	+++NONE+++	3650.6 DAYS	18.0
3	+++NONE+++	3650.1 DAYS	36.0
4	+++NONE+++	3650.9 DAYS	54.0
5	+++NONE+++	3652.5 DAYS	72.0
6	+++NONE+++	3651.0 DAYS	90.0
7	+++NONE+++	3653.0 DAYS	108.0
8	+++NONE+++	3651.0 DAYS	126.0
9	+++NONE+++	3652.0 DAYS	144.0
10	+++NONE+++	3651.4 DAYS	162.0
11	+++NONE+++	3651.8 DAYS	180.0
12	+++NONE+++	3655.7 DAYS	198.0
13	+++NONE+++	3651.2 DAYS	216.0
14	+++NONE+++	3657.6 DAYS	234.0
15	+++NONE+++	3654.5 DAYS	252.0
16	+++NONE+++	3650.7 DAYS	270.0
17	+++NONE+++	3651.2 DAYS	288.0
18	+++NONE+++	3650.4 DAYS	306.0
19	+++NONE+++	3652.9 DAYS	324.0
20	+++NONE+++	3650.6 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
-------------------------	-----------------	--------------------	--------------------------

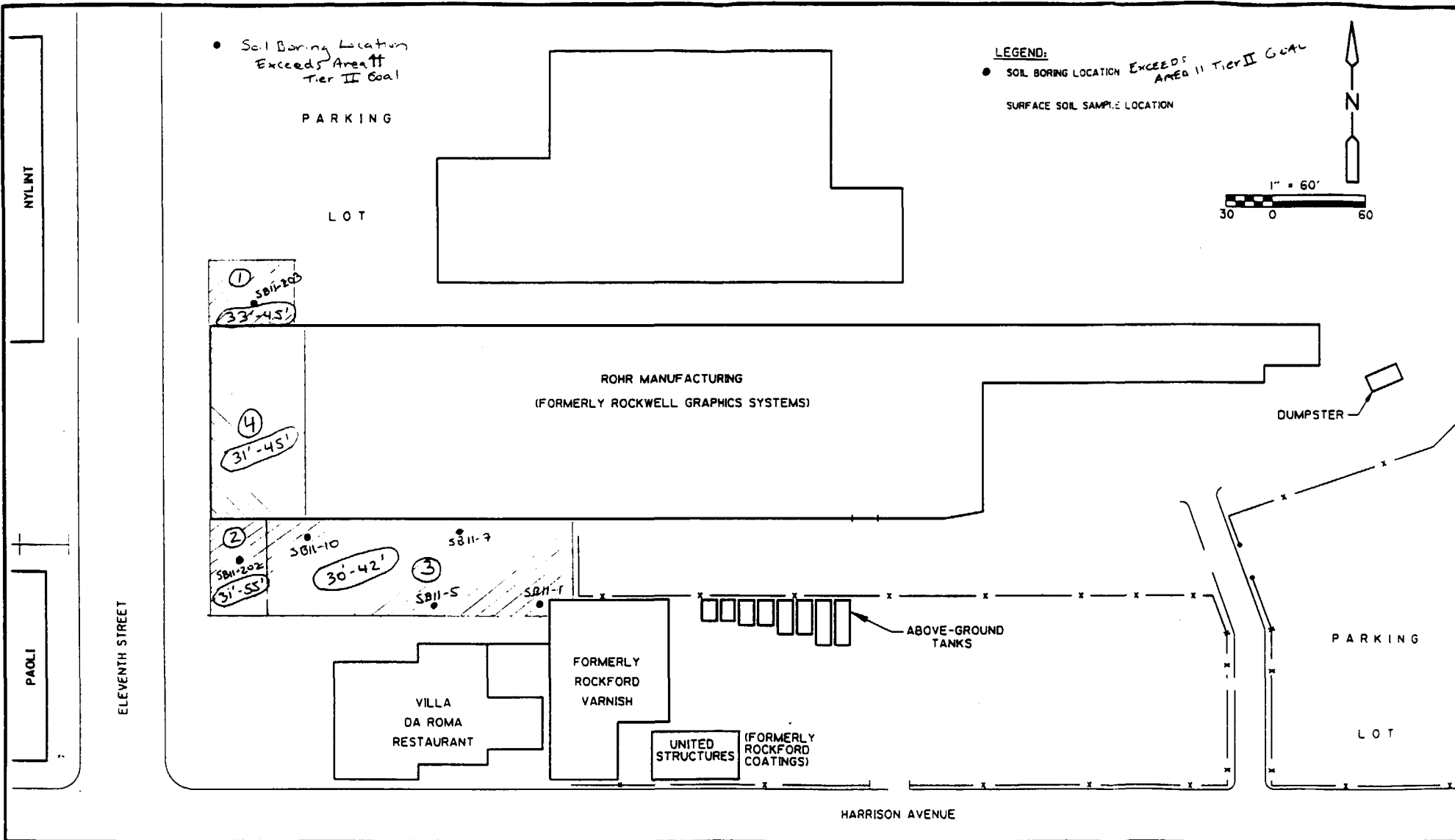
1	+++NONE+++	3651.2 DAYS	0.0
2	+++NONE+++	3652.5 DAYS	18.0
3	+++NONE+++	3650.1 DAYS	36.0
4	+++NONE+++	3652.8 DAYS	54.0
5	+++NONE+++	3651.2 DAYS	72.0
6	+++NONE+++	3650.2 DAYS	90.0
7	+++NONE+++	3651.4 DAYS	108.0

8	+++NONE+++	3651.5 DAYS	126.0
9	+++NONE+++	3651.0 DAYS	144.0
10	+++NONE+++	3650.7 DAYS	162.0
11	+++NONE+++	3650.8 DAYS	180.0
12	+++NONE+++	3650.7 DAYS	198.0
13	+++NONE+++	3653.7 DAYS	216.0
14	+++NONE+++	3650.5 DAYS	234.0
15	+++NONE+++	3650.1 DAYS	252.0
16	+++NONE+++	3650.8 DAYS	270.0
17	+++NONE+++	3650.0 DAYS	288.0
18	+++NONE+++	3650.7 DAYS	306.0
19	+++NONE+++	3652.1 DAYS	324.0
20	+++NONE+++	3652.1 DAYS	342.0

STREAMLINES DEPARTING FROM INJECTION WELL

	NUMBER OF STREAMLINE	WELL REACHED	TIME OF ARRIVAL	ANGLE BETA IN DEGREES
--	-------------------------	-----------------	--------------------	--------------------------

1	+++NONE+++	3651.8 DAYS	0.0
2	+++NONE+++	3651.3 DAYS	18.0
3	+++NONE+++	3651.5 DAYS	36.0
4	+++NONE+++	3652.6 DAYS	54.0
5	+++NONE+++	3651.3 DAYS	72.0
6	+++NONE+++	3650.5 DAYS	90.0
7	+++NONE+++	3650.3 DAYS	108.0
8	+++NONE+++	3650.2 DAYS	126.0
9	+++NONE+++	3650.0 DAYS	144.0
10	+++NONE+++	3652.7 DAYS	162.0
11	+++NONE+++	3651.6 DAYS	180.0
12	+++NONE+++	3652.7 DAYS	198.0
13	+++NONE+++	3652.4 DAYS	216.0
14	+++NONE+++	3650.0 DAYS	234.0
15	+++NONE+++	3650.5 DAYS	252.0
16	+++NONE+++	3652.0 DAYS	270.0
17	+++NONE+++	3651.2 DAYS	288.0
18	+++NONE+++	3652.0 DAYS	306.0
19	+++NONE+++	3651.1 DAYS	324.0
20	+++NONE+++	3652.9 DAYS	342.0



Area II
Contain
Areas +
Vols.
CDM
environmental engineers, scientists,
planners, & management consultants

Area II Contaminated
Areas + Volumes
(7/16/98)

Area II Contaminated
Areas + Volumes
(7/16/98)

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
AREA II SOIL BORING AND SURFACE SOIL
SAMPLE LOCATIONS

Figure No. 3-23

* Exceeds Tier II (5/19/90)
RBSL Clean-up Goals

ORG-SB-7

IS = Hot Spot

P

d

Date Sampled	6/13/96	6/13/96	6/13/96	6/25/96	6/25/96
Sample Number	SB7-101(D)	SB7-102(S)	SB7-102(D)	SB7-201-13	SB7-202-6
Depth (ft. bgs)	7-9	3-5	6-8	25-27	11-13
Organic Traffic Report Number	EBGB7	EBGB8	EBGB9	EBGL9	EBGM0

Volatile Organics (ug/Kg)

Chloromethane
Bromomethane
Vinyl Chloride
Chloroethane
Methylene Chloride
Acetone
Carbon Disulfide
1,1-Dichloroethene
1,1-Dichloroethane
1,2-Dichloroethene (total) (23 ppb)
Chloroform
1,2-Dichloroethane
2-Butanone
1,1,1-Trichloroethane (134 ppb)
Carbon Tetrachloride
Bromodichloromethane
1,2-Dichloropropane
cis-1,3-Dichloropropene
Trichloroethene (4 ppb)
Dibromochloromethane
1,1,2-Trichloroethane (2 ppb)
Benzene
trans-1,3-Dichloropropene
Bromoform
4-Methyl-2-Pentanone
2-Hexanone
Tetrachloroethene (4 ppb)
1,1,2,2-Tetrachloroethane
Toluene (840 ppb)
Chlorobenzene
Ethylbenzene (1065 ppb)
Styrene
Xylene (1135 ppb)

11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	1300	U	1400	U
19	BU	14	BU	11	JBU	1300	BU	3200	BU
11	JBU	11	JBU	11	JBU	1300	U	1400	U
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	2900	U	1400	U
11	U	11	U	7	J	47000	D	1400	U
11	U	11	U	11	U	570	J	1400	U
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	2	J	460000	D	1100	J
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	96000	D	240	J
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	480	J	1400	U
11	U	11	U	11	U	220	J	1400	U
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	23000	D	1100	J
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	29000	D	7500	J
11	U	11	U	11	U	1300	U	1600	J
11	U	11	U	11	U	81000	D	13000	J
11	U	11	U	11	U	1300	U	1400	U
11	U	11	U	11	U	190000	D	57000	J

ORG-SB-7

Date Sampled	6/26/96	6/21/93	6/21/93	6/21/93	6/21/93
Sample Number	SB7-202-6-D	SB7-1E	SB7-1F	SB7-2F	SB7-2D
Depth (ft. bgs)	11-13	20-22	25-27	25-27	15-17
Organic Traffic Report Number	EBGM1	EXR04	EXR05	EXR06	EXR07

Volatile Organics (ug/Kg)

	CA	CA	CA	CA
Chloromethane	13000 U	11 U	12 U	11 U
Bromomethane	13000 U	11 U	12 U	11 U
Vinyl Chloride	13000 U	11 U	12 U	11 U
Chloroethane	13000 U	11 U	12 U	11 U
Methylene Chloride	13000 BJU	11 UB	12 UB	11 UB
Acetone	13000 U	8 J	22 J	11 UB
Carbon Disulfide	13000 U	11 U	12 U	11 U
1,1-Dichloroethene	13000 U	11 U	12 U	11 U
1,1-Dichloroethane	13000 U	23	2 J	13
1,2-Dichloroethene (total) (23 ppb cis)	13000 U	170	99	130
Chloroform	13000 U	11 U	12 U	11 U
1,2-Dichloroethane (1 ppb)	13000 U	11 U	12 U	29
2-Butanone	13000 U	11 U	12 U	11 U
1,1,1-Trichloroethane (134 ppb)	1600 J	79	22	57
Carbon Tetrachloride	13000 U	11 U	12 U	11 U
Bromodichloromethane	13000 U	11 U	12 U	11 U
1,2-Dichloropropane	13000 U	11 U	12 U	11 U
cis-1,3-Dichloropropene	13000 U	11 U	12 U	11 U
Trichloroethene (4 ppb)	13000 U	2 J	12 U	8 J
Dibromochloromethane	13000 U	11 U	12 U	11 U
1,1,2-Trichloroethane	13000 U	11 U	12 U	11 U
Benzene	13000 U	11 U	12 U	11 U
trans-1,3-Dichloropropene	13000 U	11 U	12 U	11 U
Bromoform	13000 U	11 U	12 U	11 U
4-Methyl-2-Pentanone	13000 U	11 U	12 U	3 J
2-Hexanone	13000 U	11 U	12 U	11 U
Tetrachloroethene (4 ppb)	2500 J	6 J	2 J	3 J
1,1,2,2-Tetrachloroethane	13000 U	11 U	12 U	11 U
Toluene (868 ppb)	14000 J	1 J	12 U	13
Chlorobenzene	13000 U	11 U	12 U	11 U
Ethylbenzene (1065 ppb)	28000 J	11 U	12 U	11 U
Styrene	13000 U	11 U	12 U	11 U
Xylene (11435 ppb)	140000 J	11 U	12 U	2 J

ORG-SB-7

Date Sampled	6/22/93	6/22/93	6/22/93	6/22/93
Sample Number	SB7-3F	SB7-3G	SB7-4E	SB7-4H
Depth (ft. bgs)	25-27	30-32	20-22	35-37
Organic Traffic Report Number	EXR08	EXR09	EXR10	EXR11

Volatile Organics (ug/Kg)

	CA	CA	CA	CA
Chloromethane	U 12	U 11	1400	U 12
Bromomethane	U 12	U 11	1400	U 12
Vinyl Chloride	U 12	U 11	1400	U 12
Chloroethane	U 12	U 11	1400	U 12
Methylene Chloride	UB 12	UB 11	1400	UB 12
Acetone	UB 14	UB 11	1400	18
Carbon Disulfide	U 12	U 11	1400	U 12
1,1-Dichloroethene	U 12	U 11	1400	U 12
1,1-Dichloroethane	U 10	29	1400	18
1,2-Dichloroethene (total) (23 ppb cis)	* 39	* 56	* 700	* 130
Chloroform	U 12	U 11	1400	U 12
1,2-Dichloroethane (1 ppb)	U 12	U 11	1400	* 2
2-Butanone	U 12	U 11	1400	U 12
1,1,1-Trichloroethane (134 ppb)	62	55	* 6500	* 220
Carbon Tetrachloride	U 12	U 11	1400	U 12
Bromodichloromethane	U 12	U 11	1400	U 12
1,2-Dichloropropane	U 12	U 11	1400	U 12
cis-1,3-Dichloropropene	U 12	U 11	1400	U 12
Trichloroethene (4 ppb)	* 11	* 7	* 2400	* 66
Dibromochloromethane	U 12	U 11	1400	U 12
1,1,2-Trichloroethane	U 12	U 11	1400	U 12
Benzene	U 12	U 11	1400	U 12
trans-1,3-Dichloropropene	U 12	U 11	1400	U 12
Bromoform	U 12	U 11	1400	U 12
4-Methyl-2-Pentanone	U 12	U 11	1400	U 11
2-Hexanone	U 12	U 11	1400	U 12
Tetrachloroethene (4 ppb)	* 27	* 10	* 17000	* 95
1,1,2,2-Tetrachloroethane	U 12	U 11	1400	U 12
Toluene (868 ppb)	2	9	* 2000	77
Chlorobenzene	U 12	U 11	1400	U 12
Ethylbenzene	J 12	U 11	990	9 J
Styrene	U 12	U 11	1400	U 12
Xylene	U 12	U 11	6200	49

ORG-SB-7

Date Sampled	6/22/93	6/22/93	6/22/93	6/22/93	6/22/93
Sample Number	SB7-5B	SB7-5E	SB7-5E(D)	SB7-6F	SB7-6H
Depth (ft. bgs)	5-7	20-22	20-22	25-27	35-37
Organic Traffic Report Number	EXR12	EXR13	EXR14	EXR15	EXR16

Volatile Organics (ug/Kg)

Chloromethane
 Bromomethane
 Vinyl Chloride
 Chloroethane
 Methylene Chloride
 Acetone
 Carbon Disulfide
 1,1-Dichloroethene
 1,1-Dichloroethane
 1,2-Dichloroethene (total) (23 ppb)
 Chloroform
 1,2-Dichloroethane
 2-Butanone
 1,1,1-Trichloroethane (134 ppb)
 Carbon Tetrachloride
 Bromodichloromethane
 1,2-Dichloropropane
 cis-1,3-Dichloropropene
 Trichloroethene (4 ppb)
 Dibromochloromethane
 1,1,2-Trichloroethane
 Benzene
 trans-1,3-Dichloropropene
 Bromoform
 4-Methyl-2-Pentanone
 2-Hexanone
 Tetrachloroethene (4 ppb)
 1,1,2,2-Tetrachloroethane
 Toluene (868 ppb)
 Chlorobenzene
 Ethylbenzene (1065 ppb)
 Styrene
 Xylene

CA	CA	CA	CA	CA
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	1400 U	14 U	14
11 UB	1400 UB	1400 UB	14 UB	14
10 BJ	1400 U	1400 U	25	10
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	240 J	14 U	14
5 J	* 1700	* 8800	* 64	9
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	1400 U	14 U	14
11 U	* 5300	* 26000	35	14
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	1400 U	14 U	14
3 J	* 630	* 3000	2 J	14
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	1400 U	14 U	14
11 U	1400 U	1400 U	14 U	14
* 29	* 8400	* 24000	* 32	* 14
11 U	1400 U	1400 U	14 U	14
23	320 J	* 1000 J	8 J	2
11 U	1400 U	1400 U	14 U	14
2 J	520 J	* 1300 J	13 J	14
11 U	1400 U	1400 U	14 U	14
11	3400	8900	88	11

ORG-SB-7

Date Sampled	6/23/93	6/23/93	6/23/93	6/23/93
Sample Number	SB7-7I	SB7-7F	SB7-8D	SB7-8I
Depth (ft. bgs)	40-42	25-27	15-17	45-47
Organic Traffic Report Number	EXR-17	EXR18	EXR19	EXR20

Volatile Organics (ug/Kg)

	CA	CA	CA	CA
Chloromethane	U 56	U 1300	U 27000	U 1300
Bromomethane	U 56	U 1300	U 27000	U 1300
Vinyl Chloride	U 56	U 1300	U 27000	U 1300
Chloroethane	U 56	U 1300	U 27000	U 1300
Methylene Chloride	UB 56	UB 1300	UB 27000	UB 1300
Acetone	J 140	U 1300	U 27000	U 1300
Carbon Disulfide	U 56	U 1300	U 27000	U 1300
1,1-Dichloroethene	U 56	U 1300	U 27000	U 1300
1,1-Dichloroethane	U 18	J 1300	U 27000	U 1300
1,2-Dichloroethene (total) (23ppb cis)	J * 260	* 970	* 15000	U 1300
Chloroform	U 56	U 1300	U 27000	U 1300
1,2-Dichloroethane	U 56	U 1300	U 27000	U 1300
2-Butanone	U 56	U 1300	U 27000	U 1300
1,1,1-Trichloroethane (134ppb)	J * 530	* 25000	* 380000	* 190 J
Carbon Tetrachloride	U 56	U 1300	U 27000	U 1300
Bromodichloromethane	U 56	U 1300	U 27000	U 1300
1,2-Dichloropropane	U 56	U 1300	U 27000	U 1300
cis-1,3-Dichloropropene	U 56	U 1300	U 27000	U 1300
Trichloroethene (4ppb)	U * 340	* 10000	* 130000	* 150 J
Dibromochloromethane	U 56	U 1300	U 27000	U 1300
1,1,2-Trichloroethane	U 56	U 1300	U 27000	U 1300
Benzene	U 56	U 1300	U 27000	U 1300
trans-1,3-Dichloropropene	U 56	U 1300	U 27000	U 1300
Bromoform	U 56	U 1300	U 27000	U 1300
4-Methyl-2-Pentanone	U 56	U 1300	U 27000	U 1300
2-Hexanone	U 56	U 1300	U 27000	U 1300
Tetrachloroethene (4ppb)	J * 920	* 24000	* 260000	* 1200 J
1,1,2,2-Tetrachloroethane	U 56	U 1300	U 27000	U 1300
Toluene (848ppb)	J 140	* 2100	* 23000	U 1300
Chlorobenzene	U 56	U 1300	U 27000	U 1300
Ethylbenzene (1065ppb)	U 120	* 2900	* 31000	U 200 J
Styrene	U 56	U 1300	U 27000	U 1300
Xylene (11435ppb)	J 930	* 18000	* 180000	U 1200 J

ORG-SB-7

Date Sampled	6/23/93	6/23/93	6/23/93	6/24/93	6/24/93
Sample Number	SB7-9E	SB7-9J	SB7-10A	SB7-11D	SB7-12D
Depth (ft. bgs)	20-22	45-47	5-7	20-22	20-22
Organic Traffic Report Number	EXR21	EXR22	EXR23	EXR25	EXR26

Volatile Organics (ug/Kg)

	CA	CA	CA	CA	CA
Chloromethane	6600 U	11 U	7100 U	12 U	12
Bromomethane	6600 U	11 U	7100 U	12 U	12
Vinyl Chloride	6600 U	11 U	7100 U	12 U	12
Chloroethane	6600 U	11 U	7100 U	12 U	12
Methylene Chloride	6600 UB	11 UB	7100 U	12 UB	12
Acetone	6600 U	11 U	7100 U	23	9
Carbon Disulfide	6600 U	11 U	7100 U	12 U	12
1,1-Dichloroethene	6600 U	11 U	7100 U	12 U	12
1,1-Dichloroethane	6600 U	11 U	7100 U	7 J	12
1,2-Dichloroethene (total) (23ppb us)	* 7200	4 J	* 49000	* 240	1
Chloroform	6600 U	11 U	7100 U	12 U	12
1,2-Dichloroethane	6600 U	11 U	7100 U	12 U	12
2-Butanone	6600 U	11 U	7100 U	12 U	12
1,1,1-Trichloroethane (134ppb)	* 66000	5 J	* 110000	100	21
Carbon Tetrachloride	6600 U	11 U	7100 U	12 U	12
Bromodichloromethane	6600 U	11 U	7100 U	12 U	12
1,2-Dichloropropane	6600 U	11 U	7100 U	12 U	12
cis-1,3-Dichloropropene	6600 U	11 U	7100 U	12 U	12
Trichloroethene (4ppb)	* 58000	* 6 J	* 5500 J	* 8 J	3
Dibromochloromethane	6600 U	11 U	7100 U	12 U	12
1,1,2-Trichloroethane	6600 U	11 U	7100 U	12 U	12
Benzene	6600 U	11 U	7100 U	12 U	12
trans-1,3-Dichloropropene	6600 U	11 U	7100 U	12 U	12
Bromoform	6600 U	11 U	7100 U	12 U	12
4-Methyl-2-Pentanone	6600 U	11 U	7100 U	12 U	12
2-Hexanone	6600 U	11 U	7100 U	12 U	12
Tetrachloroethene (4ppb)	* 100000	* 7 J	* 16000	* 5 J	* 12
1,1,2,2-Tetrachloroethane	6600 U	11 U	7100 U	12 U	12
Toluene (868ppb)	* 12000	1 J	* 23000	4 J	1
Chlorobenzene	6600 U	11 U	7100 U	12 U	12
Ethylbenzene (1065ppb)	* 14000	11 U	* 26000	1 J	12
Styrene	6600 U	11 U	1600 J	12 U	12
Xylene (11435ppb)	* 100000	6 J	* 210000	5 J	12

ORG-SB-7

Date Sampled	6/24/93	6/24/93	6/24/93	6/29/93
Sample Number	SB7-12D(D)	SB7-13E	SB7-13E(D)	SB7-14C
Depth (ft. bgs)	20-22	25-27	25-27	15-17
Organic Traffic Report Number	EXR27	EXR28	EXR29	EXR44

Volatile Organics (ug/Kg)

	CA	CA	CA	CA
Chloromethane	U	11	U	11
Bromomethane	U	11	U	11
Vinyl Chloride	U	11	U	11
Chloroethane	U	11	U	11
Methylene Chloride	UB	11	UB	11
Acetone	J	18	U	11
Carbon Disulfide	U	11	U	11
1,1-Dichloroethene	U	11	U	11
1,1-Dichloroethane	U	11	U	11
1,2-Dichloroethene (total) (23 ppb cis)	J	2	J	35
Chloroform	U	11	U	11
1,2-Dichloroethane	U	11	U	11
2-Butanone	U	11	U	11
1,1,1-Trichloroethane	U	32	U	130
Carbon Tetrachloride	U	11	U	11
Bromodichloromethane	U	11	U	11
1,2-Dichloropropane	U	11	U	11
cis-1,3-Dichloropropene	U	11	U	11
Trichloroethene (4 ppb)	J	4	J	8
Dibromochloromethane	U	11	U	11
1,1,2-Trichloroethane	U	11	U	11
Benzene	U	11	U	11
trans-1,3-Dichloropropene	U	11	U	11
Bromoform	U	11	U	11
4-Methyl-2-Pentanone	U	11	U	11
2-Hexanone	U	11	U	11
Tetrachloroethene (4 ppb)	J	9	J	35
1,1,2,2-Tetrachloroethane	U	11	U	11
Toluene	J	2	J	19
Chlorobenzene	U	11	U	11
Ethylbenzene	U	11	U	11
Styrene	U	11	U	11
Xylene	U	11	U	11

ORG-SB-7

Date Sampled	6/29/93	9/23/93	9/23/93	9/24/93	9/24/93
Sample Number	SB7-14D	SB7-15A	SB7-17A	SB7-24A	SB7-24B
Depth (ft. bgs)	20-22				
Organic Traffic Report Number	EXR45	EXS10	EXS11	EXS12	EXS13

Volatile Organics (ug/Kg)

	CA	CA	CA	CA	CA
Chloromethane	1300 U	11 U	11 U	26000 U	11
Bromomethane	1300 U	11 U	11 U	26000 U	11
Vinyl Chloride	1300 U	11 U	11 U	26000 U	11
Chloroethane	1300 U	11 U	11 U	26000 U	11
Methylene Chloride (1 ppb)	1300 U	11 U	11 U	26000 U	* 12
Acetone	1300 U	11 U	11 U	8400 J	27
Carbon Disulfide	1300 U	11 U	11 U	26000 U	11
1,1-Dichloroethene	1300 U	11 U	8 J	26000 U	4
1,1-Dichloroethane	1300 U	11 U	12 J	26000 U	190
1,2-Dichloroethene (total) (23 ppb cis)	1300 U	11 U	* 61 J	26000 U	9
Chloroform	1300 U	11 U	11 U	26000 U	11
1,2-Dichloroethane (1 ppb)	1300 U	11 U	* 5 J	26000 U	* 180
2-Butanone	1500 BJ	11 U	11 U	35000 UJ	13
1,1,1-Trichloroethane (134 ppb)	* 770 J	11 U	* 280 D	* 360000	51
Carbon Tetrachloride	1300 U	11 U	11 U	26000 U	11
Bromodichloromethane	1300 U	11 U	11 U	26000 U	11
1,2-Dichloropropane	1300 U	11 U	11 U	26000 U	11
cis-1,3-Dichloropropene	1300 U	11 U	11 U	26000 U	11
Trichloroethene (4 ppb)	1300 U	11 U	* 48 J	* 24000 J	* 21
Dibromochloromethane	1300 U	11 U	11 U	26000 U	11
1,1,2-Trichloroethane	1300 U	11 U	11 U	26000 U	11
Benzene	1300 U	11 U	11 U	26000 U	11
trans-1,3-Dichloropropene	1300 U	11 U	11 U	26000 U	11
Bromoform	1300 U	11 U	11 U	26000 U	11
4-Methyl-2-Pentanone	1300 U	11 U	11 U	26000 U	82
2-Hexanone	1300 U	11 U	11 U	26000 U	11
Tetrachloroethene (4 ppb)	* 24000	11 U	* 200 J	* 110000	* 22
1,1,2,2-Tetrachloroethane	1300 U	11 U	11 U	26000 U	11
Toluene	1300 U	11 U	11 U	26000 U	4
Chlorobenzene	1300 U	11 U	11 U	26000 U	11
Ethylbenzene (1065 ppb)	1300 U	11 U	11 U	* 15000 J	11
Styrene	1300 U	11 U	11 U	26000 U	11
Xylene (11,435 ppb)	2300	11 U	11 U	* 110000	19

ORG-SB-7

Date Sampled	10/12/93	10/13/93	10/14/93	8/17/93
Sample Number	SB7-19B	SB7-22D	SB7-23G	SB135F
Depth (ft. bgs)				30-32
Organic Traffic Report Number	EXT08	EXT09	EXT10	EXR70

Volatile Organics (ug/Kg)

	CA	CA	CA	CA
Chloromethane	U 1400	U 1300	U 11	U 11
Bromomethane	U 1400	U 1300	U 11	U 11
Vinyl Chloride	U 1400	U 1300	U 11	U 11
Chloroethane	U 1400	U 1300	U 11	U 11
Methylene Chloride (1ppb)	1400	1300	11	* 6
Acetone	1400	1300	8	7
Carbon Disulfide	U 1400	U 1300	U 11	2
1,1-Dichloroethene	J 1400	U 1300	U 11	8
1,1-Dichloroethane	1400	U 1300	U 11	11
1,2-Dichloroethene (total)(23ppbcis)	J 1400	* 10000	U 11	* 130
Chloroform	U 1400	U 1300	U 11	11
1,2-Dichloroethane	1400	U 1300	U 11	11
2-Butanone	1400	U 1300	U 11	11
1,1,1-Trichloroethane (134ppb)	* 2200	* 30000	U 11	110
Carbon Tetrachloride	U 1400	U 1300	U 11	11
Bromodichloromethane	U 1400	U 1300	U 11	11
1,2-Dichloropropane	U 1400	U 1300	U 11	11
cis-1,3-Dichloropropene	U 1400	U 1300	U 11	11
Trichloroethene (4ppb)	1400	* 960	U 11	* 15
Dibromochloromethane	U 1400	U 1300	U 11	11
1,1,2-Trichloroethane	U 1400	U 1300	U 11	11
Benzene	U 1400	U 1300	U 11	11
trans-1,3-Dichloropropene	U 1400	U 1300	U 11	11
Bromoform	U 1400	U 1300	U 11	11
4-Methyl-2-Pentanone	1400	U 1300	U 11	11
2-Hexanone	U 1400	U 1300	U 11	11
Tetrachloroethene (4ppb)	1400	* 8800	* 14	* 130
1,1,2,2-Tetrachloroethane	U 1400	U 1300	U 11	11
Toluene (868ppb)	J 250	* 1500	U 11	11
Chlorobenzene	U 1400	U 1300	U 11	11
Ethylbenzene (1065ppb)	* 1700	* 4400	U 11	11
Styrene	U 1400	U 1300	U 11	11
Xylene (11435ppb)	* 13000	* 19000	U 11	11

ORG-SB-7

Date Sampled	8/19/93	8/19/93	8/20/93	8/23/93	8/24/93
Sample Number	SB134A	SB134B	SB134C	SB112A	SB112B
Depth (ft. bgs)	9-11	19-21	39-41	35-37	53-55
Organic Traffic Report Number	EXR71	EXR72	EXR73	EXR74	EXR75

Volatile Organics (ug/Kg)

	CA	CA	CA	CA	CA
Chloromethane	11 U	13 U	11 U	11 U	12 U
Bromomethane	11 U	13 U	11 U	11 U	12 U
Vinyl Chloride	11 U	13 U	11 U	11 U	12 U
Chloroethane	11 U	13 U	11 U	11 U	12 U
Methylene Chloride (1 ppb)	* 6 J	* 13	* 9 U	* 7 J	12 U
Acetone	10 J	94	19	17	7 J
Carbon Disulfide	2 J	2 J	2 J	11 U	12 U
1,1-Dichloroethene	3 J	11 J	11 U	11 U	12 U
1,1-Dichloroethane	39	58	2 J	11 U	12 U
1,2-Dichloroethene (total)(23 ppb cis)	1300 U	* 350	15	11 U	12 U
Chloroform	11 U	13 U	2 J	11 U	12 U
1,2-Dichloroethane	11 U	13 U	11 U	11 U	12 U
2-Butanone	11 U	12 J	3 J	11 U	12 U
1,1,1-Trichloroethane (134 ppb)	* 580 JD	* 1200 JD	43	11 U	31
Carbon Tetrachloride	11 U	13 U	11 U	11 U	12 U
Bromodichloromethane	11 U	13 U	11 U	11 U	12 U
1,2-Dichloropropane	11 U	13 U	11 U	11 U	12 U
cis-1,3-Dichloropropene	11 U	13 U	11 U	11 U	12 U
Trichloroethene (4 ppb)	* 590 UD	* 8 J	* 13	11 U	12 U
Dibromochloromethane	11 U	13 U	11 U	11 U	12 U
1,1,2-Trichloroethane (2 ppb)	* 4 J	* 7 J	11 U	11 U	12 U
Benzene	11 U	13 U	11 U	11 U	12 U
trans-1,3-Dichloropropene	11 U	13 U	11 U	11 U	12 U
Bromoform	11 U	13 U	11 U	11 U	12 U
4-Methyl-2-Pentanone	11 U	13 U	11 U	11 U	12 U
2-Hexanone	11 U	13 U	11 U	11 U	12 U
Tetrachloroethene (4 ppb)	* 1500 UD	* 31	* 29	11 U	12 U
1,1,2,2-Tetrachloroethane	11 U	13 U	11 U	11 U	12 U
Toluene	1 J	230	2 J	11 U	12 U
Chlorobenzene	11 U	13 U	11 U	11 U	12 U
Ethylbenzene	11 U	290 E	3 J	11 U	12 U
Styrene	11 U	13 U	11 U	11 U	12 U
Xylene	11 U	1100 JD	16	11 U	12 U

APPENDIX D
DETAILED COST BACKUP

TABLE 7-1
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 4
ALTERNATIVE SCS-4A: NO-ACTION ⁽¹⁾
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
TOTAL CAPITAL COSTS	\$0
ANNUAL OPERATING AND MAINTENANCE COSTS	
TOTAL ANNUAL COSTS	\$0
REPLACEMENT COSTS	
TOTAL REPLACEMENT COSTS	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above)	\$0
Present Worth Annual O&M Costs	\$0
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$0

(1) The No Action alternative for Area 4 soils is a true "no-action" - no additional measures, which incur cost, will be taken for this alternative.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4
ALTERNATIVE SCS-4A: NO-ACTION ⁽¹⁾
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Construction/		Annual O&M	Start-up &
				Capital Cost	Installation Costs	Costs	Baseline Costs
NONE	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(1) The No Action alternative for Area 4 soils is a true "no-action" - no additional measures, which incur cost, will be taken for this alternative.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4

ALTERNATIVE SCS-4A: NO-ACTION ⁽¹⁾

DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT		COMMENTS
NONE	N/A	

(1) The No Action alternative for Area 4 soils is a true "no-action" - no additional measures, which incur cost, will be taken for this alternative.

**TABLE 7-2
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY**

**SOURCE AREA 4
ALTERNATIVE SCS-4B: LIMITED ACTION - DEED RESTRICTIONS
COST SUMMARY**

Item/Description	Total Cost
CAPITAL COSTS	
Deed Restrictions (land use)	\$25,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$25,000
Bid and Scope Contingency (10%)	\$2,500
TOTAL CAPITAL COSTS	\$28,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
None	\$0
TOTAL ANNUAL COSTS	\$0
REPLACEMENT COSTS	
None	\$0
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$28,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$0
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$28,000

- (1) Capital costs for construction items do not include oversight fees, which are accounted for separately.
 (2) Replacement costs include construction and oversight capital costs - N/A for this alternative.
 (3) Capital costs represent the present worth of the given alternative.
 (4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.
 N/A for this alternative.

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4
 ALTERNATIVE SCS-4B: LIMITED ACTION - DEED RESTRICTIONS
 DETAILED COST ESTIMATE**

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
Legal Fees	is	1	\$25,000	\$25,000			

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4
ALTERNATIVE SCS-4B: LIMITED ACTION - DEED RESTRICTIONS
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
LEGAL FEES	Based on CDM experience

TABLE 7-3
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 4
ALTERNATIVE SCS-4C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
General	\$3,000
Soil Vapor Extraction (with emission controls)	\$206,000
Catalytic Oxidation System	\$134,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$343,000
Bid Contingency (10%)	\$34,000
Scope Contingency (10%)	\$34,000
Engineering and Design (15%)	\$51,000
Oversight/Health and Safety (5%)	\$17,000
TOTAL CAPITAL COSTS	\$479,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$18,000
Regular System Maintenance/Electrical	\$22,000
Catalytic Oxidation System Maintenance	\$63,160
Post Treatment Sampling	\$32,000
TOTAL ANNUAL COSTS	\$135,160
REPLACEMENT COSTS	
None	\$0
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$479,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$1,677,000
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$2,156,000

- (1) Capital costs for construction items do not include oversight fees, which are accounted for separately.
(2) Replacement costs include construction and oversight capital costs.
(3) Capital costs represent the present worth of the given alternative.
(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4
ALTERNATIVE SCS-4C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
CONSTRUCTION				\$3,000	\$0	\$18,300	\$0
construction trailer (rental and delivery)	yr	1	\$3,300			\$3,300	
mobilization	ls	1	\$1,000	\$1,000			
demobilization	ls	1	\$1,000	\$1,000			
decon facilities	ea.	1	\$1,000	\$1,000			
health and safety equipment	yr	1	\$9,000			\$9,000	
electrical power service supply	yr	1	\$3,600			\$3,600	
water supply	yr	1	\$2,400			\$2,400	
SOIL VAPOR EXTRACTION (SVE)				\$147,500	\$2,400	\$21,500	\$0
SVE well installation	ea.	3	\$6,000		\$18,000		
SVE main system	ls	1	\$14,000	\$14,000	\$5,000	\$10,000	
SVE control panels	ls	1	\$3,000	\$3,000	\$1,000	\$500	
6" carbon steel piping	ft	210	\$57	\$11,970			
4" carbon steel piping	ft	110	\$32	\$3,520			
excavation for piping placement	ft	320	\$0.67		\$214		
electrical power requirements (10 HP)	yr.	1	\$10,000			\$10,000	
SVE treatment building	sf	800	\$180	\$144,000	included		
air/water separator tank	ls	1	\$5,000	\$5,000		\$1,000	
CATALYTIC OXIDATION (CO)				\$134,000	\$0	\$10,000	\$0
Catalytic Oxidation Unit	ls	1	\$134,000	\$134,000	included	\$10,000	
Natural Gas	ls	1	\$7,000			\$7,000	
Catalyst Replacement	ea.	9	\$7,200			\$2,160	
Sampling	ea.	8	\$5,500			\$44,000	
POST TREATMENT SAMPLING				\$0	\$0	\$37,900	\$0
Test Kits/Field Screening (per year)	samples	11	\$300			\$3,300	
Laboratory Analysis (VOCs, N, P) (per year)	samples	131	\$200			\$26,200	
shipping and handling (per year)	shipmt	24	\$100			\$2,400	

(1) All Post Treatment Sampling costs are presented in costs per number of samples and shipments required per year - costs are presented as annual O&M costs

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4
ALTERNATIVE SCS-4C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
SVE well installation	Cost associated with installation of SVE wells. Based on CDM experience.
SVE main system	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mntng, interconnecting piping and a manual motor start switch
SVE control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel pipe	Based on CDM experience
4" carbon steel pipe	Based on CDM experience
excavation for piping placement (5 foot depth)	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
electrical power requirements (10 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
SVE treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
Catalytic Oxidation Unit	Vendor estimate - Global Technologies, Inc (May 2000)
Natural Gas	Vendor estimate - Global Technologies, Inc (May 2000)
Catalyst Replacement	Vendor estimate - Global Technologies, Inc (May 2000)
Sampling	Based on CDM experience
Test Kits/ Field Screening (per year)	Based on CDM experience and average test kit costs - ~25 samples per test kit; samples collected on a grid of 1 sample/250 cy contam. mat'l; 1 sampling grid per 2 weeks
Laboratory Analysis (VOCs, N, P) (per year)	Based on 1998 sample analysis costs from Midwest laboratories; samples collected on a grid of 1 sample/250cy contam. material; 1 sampling grid per month (including QA/QC samples)
shipping and handling (per year)	Costs associated with transporting samples from site to laboratory twice per month

TABLE 7-4
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 4
ALTERNATIVE SCS-4D: EXCAVATION AND ON-SITE THERMAL TREATMENT
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
General	\$46,000
Excavation / On-Site Thermal Treatment	\$694,000
Excavation Dewatering	\$397,000
Post Treatment Sampling	\$9,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$1,146,000
Bid Contingency (15%)	\$172,000
Scope Contingency (15%)	\$172,000
Engineering and Design (15%)	\$172,000
Oversight/Health and Safety (5%)	\$57,000
TOTAL CAPITAL COSTS	\$1,719,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
General Maintenance of Thermal Treatment System	\$0
TOTAL ANNUAL COSTS	\$0
REPLACEMENT COSTS	
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$1,719,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$0
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$1,719,000

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% annual discount rate over a project life of 2 months.

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4
ALTERNATIVE SCS-4D: EXCAVATION AND ON-SITE THERMAL TREATMENT
DETAILED COST ESTIMATE**

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
construction trailer (rental and delivery)	mo	2	\$275	\$550			
mobilization	1s	1	\$10,000	\$10,000			
demobilization	1s	1	\$10,000	\$10,000			
decon trailer	ea	1	\$5,000	\$5,000			
vehicle decon station	ea	1	\$10,000	\$10,000			
vehicle decon equipment	ea	1	\$570	\$570			
health and safety equipment	mo	2	\$4,500	\$9,000			
electrical power service supply	mo	2	\$400	\$800			
dust control	mo	2	\$230	\$460			
mobilization/demobilization	1s	1	\$23,500	\$23,500			
pad for staging	1s	1	\$10,000	\$10,000			
temporary enclosure (rental - 88' wide by 200' long)	mo	2	\$9,583	\$19,126	\$60,000		
excavation	ton	8,084	\$5.00	\$40,320			
soil treatment	ton	3,815	\$53.00	\$202,195			
backfill and compaction	ton	8,084	\$2.00	\$16,128			
water supply (10 GPM)	mo	2	\$1,500	\$3,000			
sheet piling	lf	400	\$800	\$320,000			
Completely furnish, install, operate, and remove system: well points spaced 20' O.C.	mo	1	\$200,000		\$200,000		
analytical	batch	39	\$1,000	\$39,000			
T&D cost (15 GPM produced)	gallon	777,600	\$0.20	\$155,520			
rental of (2) 21,000 gallon tanks	mo	2	\$1,000	\$2,000			
Analytical for Volatile Organic Compounds (soils)	ea	44	\$200	\$8,800			
shipping and handling	ea	4	\$50	\$200			

In general, a bulk density of 1.4 tons/yc³ was assumed for soils material - this conversion was used for conversion of pricing giving per ton, where volume of material is given in yc³.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4
 ALTERNATIVE SCS-4D: EXCAVATION AND ON-SITE THERMAL TREATMENT
 DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon trailer	Allowance based on CDM equipment rates
vehicle decon station	20'x20' gravel pad over 11 mil plastic with plywood and joist deck per 1996 Means
vehicle decon equipment	Steam cleaning and water tank per 1996 Means
health and safety equipment	Allowance based on CDM equipment rates
electrical power service supply	Based on expected electrical costs per month for this alternative
dust control	Water truck per 1996 Means
Excavation and Thermal Treatment Unit (IHV) Mobilization/Demobilization	
mobilization/demobilization	Transportation of the Indirect Heat and Volatilization unit (IHV), frontloader, and the time involved for set-up and tear-down (vendor estimate)
pad for staging	Pad size approx. 200'x200' crushed stone or asphalt (vendor estimate)
temporary enclosure (rental - 88' wide by 200' long)	Sprung Instant Structure - vendor estimate; constr/install. costs include labor and heavy equip.
excavation	Excavation cost (vendor estimate)
soil treatment	Vendor Estimate for Direct Fired Low Temperature Thermal Desorption (includes providing a loader and operator to place contaminated soil into the cold feed bin and for restockpiling the clean processed soil);
backfill and compaction	Backfill and compaction of clean soil from stockpiling (vendor estimate)
water supply	10 GPM is needed for operation of the thermal treatment system (4,800 gpd if run for 8hrs/day); costs based on construction site water average per 1996 Means - typical
sheet piling	steel sheets, approx. 4' x 40' around perimeter of excavation; as per CDM experience
Thermal Treatment System (TDS) Mobilization/Demobilization	
Completely furnish, install, operate, and remove system; well points spaced 20' O.C.	Based on vendor estimate - MoreTrench American (June 1998); System operation 24 hours/day, 7 days/week with diesel pumps.
analytical	Based on CDM Experience
T&D cost (15 GPM produced)	Based on CDM Experience
rental of (2) 21,000 gallon tanks	Based on CDM Experience
Soil Sampling and Analysis	
Analytical for Volatile Organic Compounds (soils)	Based on 1998 sample analysis costs from Midwest laboratories; samples collected on a grid of 1 sample/250cy; 1 sampling grid per month (including QA/QC samples)
shipping and handling	Costs associated with transporting samples from site to laboratory twice per month

TABLE 7-5
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 7
ALTERNATIVE SCS-7A: NO-ACTION ⁽¹⁾
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
TOTAL CAPITAL COSTS	\$0
ANNUAL OPERATING AND MAINTENANCE COSTS	
TOTAL ANNUAL COSTS	\$0
REPLACEMENT COSTS	
TOTAL REPLACEMENT COSTS	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above)	\$0
Present Worth Annual O&M Costs	\$0
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$0

(1) The No Action alternative for Area 7 soils is a true "no-action" - no additional measures, which incur cost, will be taken for this alternative.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
ALTERNATIVE SCS-7A: NO-ACTION ⁽¹⁾
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation	Annual O&M	Start-up & Baseline
					Costs	Costs	Costs
NONE	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(1) The No Action alternative for Area 7 soils is a true "no-action" - no additional measures, which incur cost, will be taken for this alternative.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
ALTERNATIVE SCS-7A: NO-ACTION ⁽¹⁾
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT		COMMENTS
NONE	N/A	

(1) The No Action alternative for Area 7 soils is a true "no-action" - no additional measures, which incur cost, will be taken for this alternative.

TABLE 7-6
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 7
ALTERNATIVE SCS-7B: LIMITED ACTION - PARK DEMOLITION, ACCESS AND DEED
RESTRICTIONS
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
Access Restrictions (fencing and signs)	\$34,000
Park Demolition	\$10,000
Deed Restrictions (land use)	\$25,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$69,000
TOTAL CAPITAL COSTS	\$69,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
Signs and Fence Maintenance	\$200
TOTAL ANNUAL COSTS	\$200
REPLACEMENT COSTS	
Access Restrictions (fencing and signs) (every 2 years)	\$34,000
TOTAL REPLACEMENT COSTS ⁽²⁾	\$34,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$69,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$2,000
Present Worth Replacement Costs	\$204,000
TOTAL PRESENT WORTH	\$275,000

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
ALTERNATIVE SCS-7B: LIMITED ACTION - PERK DEMOLITION, ACCESS AND DEED RESTRICTIONS
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
security fence (perimeter w/ 10% contingency)	linear feet	2580	\$12.60	\$32,508	included in cap.		
add for corner posts, 3" diam., galv. steel	each	4	\$90.50	\$362			
add for 3' wide gate	each	2	\$240	\$480			
signs (reflective with warnings, clip to fence)	each	7	\$25.00	\$175		\$175	
baseball court, tennis court, and playground	is	1	\$10,000	\$10,000			
legal fees	is	1	\$25,000	\$25,000			

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
 ALTERNATIVE SCS-7B: LIMITED ACTION - PARK DEMOLITION ACCESS AND DEED RESTRICTIONS
 DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
security fence (perimeter w/ 10% contingency)	6' high plus 3 strand barbed wire, 2" line post @ 10' O.C., 1-5/8" top rail; 9 ga. wire galv. steel; 1996 Means; Note: Labor/installation cost included under capital cost.
add for corner posts, 3" diam., galv. steel	3" diam., galv. steel; as per 1996 Means
add for 3' wide gate	Gate for 6' high fence, 1-5/8" frame, 3' wide, galv. steel; as per 1996 Means
signs (reflective with warnings)	Reflective w/ warning message attached to fence - placement every 500 feet - per 1996 Lab Safety Catalogue
basketball court, tennis courts, and playground	Based on CDM experience
legal fees	Based on CDM experience

TABLE 7-7
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 7
**ALTERNATIVE SCS-7C: EXCAVATION AND ON-SITE BIOLOGICAL TREATMENT/
RECREATIONAL FACILITIES REPLACEMENT**
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
General	\$35,000
Ex-Situ Biological Treatment	\$4,574,000
Excavation Dewatering	\$5,398,000
Recreational Facilities Replacement	\$90,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$10,095,000
Bid Contingency (15%)	\$1,514,000
Scope Contingency (20%)	\$2,019,000
Engineering and Design (15%)	\$1,514,000
Oversight/Health and Safety (5%)	\$505,000
TOTAL CAPITAL COSTS	\$15,647,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$8,000
Fence Maintenance	\$200
Post Treatment Sampling	\$621,000
TOTAL ANNUAL COSTS	\$627,000
REPLACEMENT COSTS	
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$15,647,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$2,571,000
Present Worth Replacement Costs ⁽⁵⁾	\$0
TOTAL PRESENT WORTH	\$18,218,000

- (1) Capital costs for construction items do not include oversight fees, which are accounted for separately.
(2) Replacement costs include construction and oversight capital costs.
(3) Capital costs represent the present worth of the given alternative.
(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 5 years.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
ALTERNATIVE SCS-7C: EXCAVATION AND ON-SITE BIOLOGICAL TREATMENT/ RECREATIONAL FACILITIES REPLACEMENT
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
construction trailer (rental and delivery)	yr	1	\$275			\$275	
mobilization	ls	1	\$10,000	\$10,000			
demobilization	ls	1	\$10,000	\$10,000			
decon trailer	ea	1	\$5,000	\$5,000			
vehicle decon station	ea	1	\$10,000	\$10,000			
health and safety equipment	yr	1	\$570			\$570	
electrical power service supply	yr	1	\$4,500			\$4,500	
water supply	yr	1	\$400			\$400	
dust control	yr	1	\$230			\$230	
				\$32,500			
security fence (perimeter w/ 10% contingency)	linear feet	2580	\$12.00	\$32,508		\$200	
Mobilization/ Site Preparation/ Final Grading	ls	1		\$300,000			
Strippe w/ Mining	cy	57,000	\$66.00	\$3,762,594			
excavation	ton	95,855	\$5.00	\$479,278			
				\$4,561,300			
Completely furnish, install, operate, and remove system: well points spaced 20' O.C. (year 1)	mo	11	\$450,000		\$4,950,000		
analytical	batch	85	\$1,000	\$85,000			
T&D cost (10 GPM produced)	gallon	1,884,800	\$0.20	\$336,960			
rental of (2) 21,000 gallon tanks	mo	24	\$1,000	\$24,000			
Test Kits/ Field Screening (per year)	samples	237	\$300			\$71,100	
Laboratory Analysis (VOCs, H, P) (per year)	samples	2736	\$200			\$547,200	
shipping and handling (per year)	shipment	24	\$100			\$2,400	
				\$500,000			
PLAYGROUND				PLAYGROUND			
bike rack, 10' long, permanent	ea	1	\$370	\$370	included		
climber, arch, 6' high	ea	1	\$505	\$505	included		
horizontal monkey ladder, 14' long	ea	1	\$870	\$870	included		
modular playground, platform, two levels	ea	1	\$2,100	\$2,100	included		
component, attached to platform	ea	1	\$825	\$825	included		
component, linked between platforms	ea	2	\$560	\$1,120	included		
parallel bars, 10' long	ea	1	\$425	\$425	included		
slide, stainless steel bed, 12' long, 6' high	ea	1	\$970	\$970	included		
swings, 6' high, plain seats, 4 seats	ea	1	\$885	\$885	included		
pea gravel base (1' thick)	cy	450	\$46.50	\$20,925	included		
railroad ties (6"x8") around perimeter	ft	415	\$6.60	\$2,739	included		
TENNIS COURTS				TENNIS COURTS			
tennis court complete (w/ fence and asphaltic conc.)	court	2	\$25,000	\$50,000	included		
BASKETBALL COURT				BASKETBALL COURT			
backstops, steel, single pole	ea	2	\$705.00	\$1,410	included		
asphaltic concrete pavement, binder course, 3" thick	sy	1085	\$5.40	\$5,751	included		
pavement base (prepare and roll sub-base)	sy	1085	\$1.27	\$1,353	included		

In general, a bulk density of 1.4 tons/yard³ was assumed for soils material.

(1) All Post Treatment Sampling costs are presented in costs per number of samples and shipments required per year - costs are presented as annual O&M costs

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
ALTERNATIVE SCS-7C: EXCAVATION AND ON-SITE BIOLOGICAL TREATMENT/ RECREATIONAL FACILITIES REPLACEMENT
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
construction trailer (rental and delivery)	50'x12' construction trailer - \$1,86/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon trailer	Allowance based on CDM equipment rates
vehicle decon station	20'x20' gravel pad over 11 mil plastic with plywood and joist deck per 1996 Means
health and safety equipment	Allowance based on CDM equipment rates
electrical power service supply	Steam cleaning and water tank per 1996 Means
water supply	Based on expected electrical costs per month for this alternative
dust control	Water truck per 1996 Means
Mobilization/ Site Preparation/ Final Grading	Based on CDM experience
Biopile w/ Mixing	Based on CDM experience
excavation	Excavation cost (vendor estimate)
Completely furnish, install, operate, and remove system; well points spaced 20' O.C.	Based on vendor estimate - MoreTrench American (June 1996); System operation 24 hours/day, 7 days/week with diesel pumps.
analytical	Based on CDM Experience
T&D cost (10 GPM produced)	Based on CDM Experience
rental of (2) 21,000 gallon tanks	Based on CDM Experience
Test Kits/ Field Screening (per year)	Based on CDM experience and average test kit costs - ~25 samples per test kit; samples collected on a grid of 1 sample/250 cy contam. mat'; 1 sampling grid per 2 weeks
Laboratory Analysis (VOCs, N, P) (per year)	Based on 1996 sample analysis costs from Midwest Laboratories; samples collected on a grid of 1 sample/250cy contam. material; 1 sampling grid per month (including QA/QC samples)
shipping and handling (per year)	Costs associated with transporting samples from site to laboratory twice per month
PLAYGROUND	
bike rack, 10' long, permanent	As per 1996 Means, Playfield Equipment
climber, arch, 6' high	As per 1996 Means, Playfield Equipment
horizontal monkey ladder, 14' long	As per 1996 Means, Playfield Equipment
modular playground, platform, two levels	As per 1996 Means, Playfield Equipment; treated pine/metal, 10'x12'
component, attached to platform	As per 1996 Means, Playfield Equipment
component, linked between platforms	As per 1996 Means, Playfield Equipment
parallel bars, 10' long	As per 1996 Means, Playfield Equipment
slide, stainless steel bed, 12' long, 6' high	As per 1996 Means, Playfield Equipment
swings, 6' high, plain seats, 4 seats	As per 1996 Means, Playfield Equipment
pee gravel base (1' thick)	As per 1996 Means, Trees/Plants/Ground Cover
railroad ties (6"x6") around perimeter	As per 1996 Means, Curbs
TENNIS COURTS	
tennis court complete (w/ fence and asphaltic conc.)	As per 1996 Means, Athletic Pave/Surfacing
BASKETBALL COURT	
backstops, steel, single pole	As per 1996 Means, Playfield Equipment
asphaltic concrete pavement, binder course, 3" thick	As per 1996 Means, Walk/Rd/Parking Paving
pavement base (prepare and roll sub-base)	As per 1996 Means, Walk/Rd/Parking Paving

TABLE 7-8
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 7
ALTERNATIVE SCS-7D: CONTAMINATED SOILS EXCAVATION AND ON-SITE THERMAL TREATMENT
/ RECREATIONAL FACILITIES REPLACEMENT
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
General	\$36,000
Contaminated Soils Excavation / On-Site Thermal Treatment	\$6,683,000
Excavation Dewatering	\$4,029,000
Recreational Facilities Replacement	\$90,000
Post Treatment Sampling	\$366,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$11,204,000
Bid Contingency (10%)	\$1,120,000
Scope Contingency (10%)	\$1,120,000
Engineering and Design (10%)	\$1,120,000
Oversight/Health and Safety (5%)	\$560,000
TOTAL CAPITAL COSTS	\$15,124,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$65,000
General Maintenance of Thermal Treatment System	\$20,000
TOTAL ANNUAL COSTS	\$85,000
REPLACEMENT COSTS	
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$15,124,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$85,000
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$15,209,000

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over a project life of 8 months.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
ALTERNATIVE SCS-7D: CONTAMINATED SOILS EXCAVATION AND ON-SITE THERMAL TREATMENT / RECREATIONAL FACILITIES
REPLACEMENT
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
construction trailer (rental and delivery)	yr	1	\$3,300	\$3,300		\$3,300	
mobilization	1s	1	\$10,000	\$10,000			
demobilization	1s	1	\$10,000	\$10,000			
decon trailer	ea	1	\$5,000	\$5,000			
vehicle decon station	ea	1	\$10,000	\$10,000			
vehicle decon equipment	ea	1	\$570	\$570			
health and safety equipment	yr	1	\$54,000			\$54,000	
electrical power service supply	yr	1	\$4,800			\$4,800	
dust control	yr	1	\$2,800			\$2,800	
mobilization/demobilization	1s	1	\$23,500	\$23,500			
pad for staging	1s	1	\$10,000	\$10,000			
temporary enclosure (rental - 88' wide by 200' long)	mo	8	\$9,583	\$76,504	\$80,000		
excavation	ton	95,855	\$5	\$479,276			
soil treatment	ton	79,813	\$53	\$4,230,068		\$20,000	
backfill and compaction	ton	95,855	\$2	\$191,710			
water supply (10 GPM)	mo	8	\$1,500	\$12,000			
sheet piling	ft	2,000	\$800	\$1,600,000			
Completely furnish, install, operate, and remove system: well points spaced 20' O.C.	mo	8	\$450,000		\$3,600,000		
analytical	batch	84	\$1,000	\$84,000			
T&D cost (10 GPM produced)	gallon	1,684,800	\$0.20	\$336,960			
rental of (2) 21,000 gallon tanks	mo	8	\$1,000	\$8,000			
PLAYGROUND							
bike rack, 10' long, permanent	ea	1	\$370	\$370	included		
climber, arch, 6' high	ea	1	\$505	\$505	included		
horizontal monkey ladder, 14' long	ea	1	\$670	\$670	included		
modular playground, platform, two levels	ea	1	\$2,100	\$2,100	included		
component, attached to platform	ea	1	\$825	\$825	included		
component, linked between platforms	ea	2	\$560	\$1,120	included		
parallel bars, 10' long	ea	1	\$425	\$425	included		
slide, stainless steel bed, 12' long, 6' high	ea	1	\$970	\$970	included		
swings, 6' high, plain seats, 4 seats	ea	1	\$885	\$885	included		
pee gravel base (1' thick)	cy	450	\$46.50	\$20,925	included		
railroad ties (6"x8") around perimeter	ft	415	\$6.60	\$2,739	included		
TENNIS COURTS							
tennis court complete (w/ fence and asphaltic conc.)	court	2	\$25,000	\$50,000	included		
BASKETBALL COURT							
backstops, steel, single pole	ea	2	\$705.00	\$1,410	included		
asphaltic concrete pavement, binder coarse, 3" thick	sy	1065	\$5.40	\$5,751	included		
pavement base (prepare and roll sub-base)	sy	1065	\$1.27	\$1,353	included		
Analytical for Volatile Organic Compounds (soils)	ea	1824	\$200	\$364,800			
shipping and handling	ea	16	\$50	\$800			

In general, a bulk density of 1.4 tons/yard³ was assumed for soils material.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
ALTERNATIVE SCS-7D: CONTAMINATED SOILS EXCAVATION AND ON-SITE THERMAL TREATMENT / RECREATIONAL FACILITIES
REPLACEMENT
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT		COMMENTS
CONSTRUCTION TRAILER (rental and delivery)		50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization		Heavy equipment and trailers, per vendor estimate
demobilization		Allowance for trailer and equipment demobilization
decon trailer		Allowance based on CDM equipment rates
vehicle decon station		20'x20' gravel pad over 11 mil plastic with plywood and joist deck per 1996 Means
vehicle decon equipment		Steam cleaning and water tank per 1996 Means
health and safety equipment		Allowance based on CDM equipment rates
electrical power service supply		Steam cleaning and water tank per 1996 Means
dust control		Water truck per 1996 Means
mobilization/demobilization		Transportation of the Indirect Heat and Volatilization unit (IHV), frontloader, and the time involved for set-up and tear-down (vendor estimate)
pad for staging		Pad size approx. 200'x200' crushed stone or asphalt (vendor estimate)
temporary enclosure (rental - 88' wide by 200' long)		Spring Instant Structure - vendor estimate; constr/install. costs include labor and heavy equip.
excavation		Excavation cost (vendor estimate)
soil treatment		Vendor Estimate for Direct Fired Low Temperature Thermal Desorption (includes providing a loader and operator to place contaminated soil into the cold feed bin and for restockpiling the clean processed soil);
backfill and compaction		Backfill and compaction of clean soil from stockpiling (vendor estimate)
water supply		10 GPM is needed for operation of the thermal treatment system (4,800 gpd if run for 8hrs/day); costs based on construction site water average per 1996 Means - typical
sheet piling		Steel sheets, approx. 4' x 40' around perimeter of excavation; as per CDM experience
COMPLETELY FURNISH, INSTALL, OPERATE, AND REMOVE SYSTEM:		
well points spaced 20' O.C.		Based on vendor estimate - MoreTrench American (June 1998); System operation 24 hours/day, 7 days/week with diesel pumps.
analytical		Based on CDM Experience
T&D cost (10 GPM produced)		Based on CDM Experience
rental of (2) 21,000 gallon tanks		Based on CDM Experience
PLAYGROUND		
bike rack, 10' long, permanent		As per 1996 Means, Playfield Equipment
climber, arch, 6' high		As per 1996 Means, Playfield Equipment
horizontal monkey ladder, 14' long		As per 1996 Means, Playfield Equipment
modular playground, platform, two levels		As per 1996 Means, Playfield Equipment; treated pine/metal, 10'x12'
component, attached to platform		As per 1996 Means, Playfield Equipment
component, linked between platforms		As per 1996 Means, Playfield Equipment
parallel bars, 10' long		As per 1996 Means, Playfield Equipment
slide, stainless steel bed, 12' long, 6' high		As per 1996 Means, Playfield Equipment
swings, 6' high, plain seats, 4 seats		As per 1996 Means, Playfield Equipment
pea gravel base (1' thick)		As per 1996 Means, Trees/Plants/Ground Cover
railroad ties (6"x8") around perimeter		As per 1996 Means, Curbs
TENNIS COURTS		
tennis court complete (w/ fence and asphaltic conc.)		As per 1996 Means, Athletic Pave/Surfacing
BASKETBALL COURT		
backstops, steel, single pole		As per 1996 Means, Playfield Equipment
asphaltic concrete pavement, binder coarse, 3" thick		As per 1996 Means, Walk/Rd/Parking Paving
pavement base (prepare and roll sub-base)		As per 1996 Means, Walk/Rd/Parking Paving
Analytical for Volatile Organic Compounds (soils)		Based on 1996 sample analysis costs from Midwest laboratories; samples collected on a grid of 1 sample/250cy; 1 sampling grid per month (including QA/QC samples)
shipping and handling		Costs associated with transporting samples from site to laboratory twice per month

TABLE 7-9
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FOCUSED FEASIBILITY STUDY

SOURCE AREA 7

ALTERNATIVE SCS-7E: SOIL VAPOR EXTRACTION (SVE)/AIR SPARGING (AS) ALONG SOURCE
AREA / MONITORING / GROUNDWATER USE RESTRICTIONS / CATALYTIC OXIDATION
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
General	\$167,000
Leachate Monitoring Wells	\$120,000
VRS/Catalytic Oxidation System	\$976,000
Air Sparging	\$694,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$1,982,000
Bid Contingency (15%)	\$297,000
Scope Contingency (20%)	\$396,000
Engineering and Design (15%)	\$297,000
Oversight/Health and Safety (5%)	\$99,000
TOTAL CAPITAL COSTS	\$3,071,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$24,000
VRS Regular Maintenance/Electrical	\$63,000
Leachate Sampling and Analysis (per event)	\$28,000
Catalytic Oxidation Maintenance	\$109,000
Regular System Maintenance/Electrical	\$96,000
TOTAL ANNUAL COSTS	\$320,000
REPLACEMENT COSTS	
Leachate Monitoring Wells (every 15 years)	\$29,000
Equipment Replacement (e.g., motors, blowers) - every 15 years	\$30,000
TOTAL REPLACEMENT COSTS ⁽²⁾	\$59,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$3,071,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$2,051,000
Leachate Sampling	
Quarterly Sampling - years 1 and 2	\$207,000
Semi-annual Sampling - years 3 through 10	\$295,000
Present Worth Replacement Costs ⁽⁵⁾	\$0
TOTAL PRESENT WORTH	\$5,624,000

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over 10 years.

(5) Present worth of replacement costs is based on a 7% annual discount rate and no replacement of leachate monitoring wells and system equipment.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
ALTERNATIVE SCL-7E: SOIL VAPOR EXTRACTION (SVE)/AIR SPARGING (AS) ALONG GMZ BOUNDARY AND SOURCE AREA / MONITORING /
GROUNDWATER USE RESTRICTIONS / CATALYTIC OXIDATION
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
<i>legal fees</i>	ls	1	\$25,000	\$25,000			
<i>construction trailer (rental and delivery)</i>	mo	3	\$275	\$825			
<i>mobilization</i>	ls	1	\$1,000	\$1,000			
<i>demobilization</i>	ls	1	\$1,000	\$1,000			
<i>decon facilities</i>	ea	1	\$1,000	\$1,000			
<i>health and safety equipment</i>	mo	3	\$2,000	\$6,000		\$24,000	
<i>electrical power service connection</i>	ls	1	\$5,000	\$5,000			
<i>electrical power service supply</i>	mo	3	\$400	\$1,200			
<i>water supply</i>	mo	3	\$200	\$600			
<i>Pilot Scale Study</i>	ls	1	\$150,000	\$60,000	\$40,000		\$50,000
<i>Leachate - monitoring well installation and materials</i>	well	5	\$6,000		\$30,000		
<i>Performance Monitoring well installation and materials</i>	well	15	\$6,000		\$90,000		
<i>labor</i>	hours	40	\$60			\$2,400	
<i>vehicle</i>	day	2	\$60			\$120	
<i>equipment</i>	ls	1	\$600			\$600	
<i>miscellaneous</i>	ls	1	\$1,000			\$500	
<i>Leachate laboratory analysis</i>	each	20	\$230			\$4,600	
<i>quarterly reports</i>	each	4	\$5,000			\$20,000	
<i>VRS well installation</i>	ea.	16	\$6,000		\$96,000		
<i>VRS main system</i>	ls	2	\$50,000	\$100,000	\$20,000	\$20,000	\$25,000
<i>VRS control panels</i>	ls	2	\$10,000	\$20,000	\$1,000	\$4,000	
<i>6" carbon steel piping</i>	ft	3000	\$57	\$171,000		\$5,000	
<i>4" carbon steel piping</i>	ft	500	\$32	\$16,000		\$3,200	
<i>excavation for piping placement</i>	ft	3500	\$4.41		\$15,435		
<i>electrical power requirements (10 HP)</i>	yr.	1	\$20,000			\$20,000	
<i>VRS treatment building</i>	sf	1200	\$180	\$216,000	included		
<i>air/water separator tank</i>	ls	2	\$10,000	\$20,000		\$4,000	
<i>air/water separator tank - condensate disposal</i>	gal	260	\$25			\$6,500	
<i>Catalytic Oxidation Unit</i>	ls	1	\$276,000	\$276,000	included	\$10,000	
<i>Natural Gas</i>	ls	1	\$43,800			\$43,800	
<i>Catalyst Replacement</i>	ea	3	\$38,400			\$11,520	
<i>Sampling</i>	ea	8	\$5,500			\$44,000	
<i>AS well installation</i>	ea	57	\$6,000		\$342,000		
<i>AS main system</i>	ls	1	\$100,000	\$100,000	\$20,000	\$20,000	\$25,000
<i>AS control panels</i>	ls	1	\$3,000	\$3,000	\$1,500	\$600	
<i>6" carbon steel piping</i>	ft	3000	\$57	\$171,000		\$34,200	
<i>4" carbon steel piping</i>	ft	500	\$32	\$16,000		\$3,200	
<i>excavation for piping placement</i>	ft	3500	\$4.41		\$15,435		
<i>condensate disposal</i>	gal	520	\$25			\$13,000	
<i>electrical power requirements (25 HP)</i>	year	1	\$25,000			\$25,000	
<i>AS treatment building</i>	Costs for AS treatment building included with corresponding VRS						
<i>air/water separator tank</i>	Costs for air/water separator tank included with corresponding VRS						
<i>catalytic oxidation treatment</i>	Costs for catalytic oxidation treatment included with corresponding VRS						

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
ALTERNATIVE SCL-7E: SOIL VAPOR EXTRACTION (SVE)/AIR SPARGING (AS) ALONG GMZ BOUNDARY AND SOURCE AREA /
MONITORING / GROUNDWATER USE RESTRICTIONS / CATALYTIC OXIDATION
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
<i>legal fees</i>	Cost based on CDM experience
<i>construction trailer (rental and delivery)</i>	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
<i>mobilization</i>	Heavy equipment and trailers, per vendor estimate
<i>demobilization</i>	Allowance for trailer and equipment demobilization
<i>decon facilities</i>	Based on level of personal and vehicle decontamination anticipated for this alternative
<i>health and safety equipment</i>	Allowance based on CDM equipment rates
<i>electrical power service connection</i>	Based on CDM experience
<i>electrical power service supply</i>	Based on expected electrical costs per month for this alternative
<i>water supply</i>	Based on expected use per month for this alternative (e.g., decon, personnel use)
<i>Leachate monitoring well installation and materials</i>	Cost based on CDM experience in monitoring well installation
<i>Performance monitoring well installation and materials</i>	Cost based on CDM experience in monitoring well installation
<i>labor</i>	Based on 10 hour work day at the average CDM labor rate of \$60 for oversite personnel
<i>vehicle</i>	Based on \$300/week rental fee for a field vehicle
<i>equipment</i>	Based on CDM equipment rental rates
<i>miscellaneous</i>	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
<i>leachate laboratory analysis</i>	Based on average cost incurred for VOC analysis; One duplicate and one blank will be collected per 10 samples.
<i>VRS well installation</i>	Cost associated with installation of SVE wells. Based on CDM experience.
<i>VRS main system</i>	Vendor: Includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mounting, interconnecting piping and a manual motor start switch
<i>VRS control panels</i>	Vendor estimate - NEEP (May 1998)
<i>6" carbon steel pipe</i>	Based on CDM experience
<i>4" carbon steel pipe</i>	Based on CDM experience
<i>excavation for piping placement (4 foot depth)</i>	12" wide trench and backfill, 48" deep as per 2000 Means
<i>electrical power requirements (10 HP)</i>	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
<i>VRS treatment building</i>	Basic prefabricated building on concrete pad. Based on CDM experience.
<i>air/water separator tank</i>	Based on CDM experience
<i>air/water separator tank - condensate disposal</i>	Based on CDM experience
<i>Catalytic Oxidation Unit</i>	Vendor estimate - Global Technologies, Inc (May 2000)
<i>Natural Gas</i>	Vendor estimate - Global Technologies, Inc (May 2000)
<i>Catalyst Replacement</i>	Vendor estimate - Global Technologies, Inc (May 2000)
<i>Sampling</i>	Based on CDM experience
AS (Soil Vapor Extraction)	
<i>AS well installation</i>	Cost associated with installation of AS wells. Based on CDM experience.
<i>AS main system</i>	Vendor: Includes blower, exp motor, inline silencer, pressure relief valve, unitized base, pressure gauge and a manual motor starting switch.
<i>AS control panels</i>	Vendor estimate
<i>6" carbon steel piping</i>	Based on CDM experience
<i>4" carbon steel piping</i>	Based on CDM experience
<i>excavation for piping placement</i>	12" wide trench and backfill, 48" deep as per 2000 Means
<i>condensate disposal</i>	Based on CDM experience
<i>electrical power requirements (25 HP)</i>	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
<i>AS treatment building</i>	Costs for AS treatment building included with corresponding VRS
<i>air/water separator tank</i>	Costs for air/water separator tank included with corresponding VRS
<i>catalytic oxidation treatment</i>	Costs for catalytic oxidation treatment included with corresponding VRS

TABLE 7-10
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 9/10
ALTERNATIVE SCS-9/10A: NO-ACTION ⁽¹⁾
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
TOTAL CAPITAL COSTS	\$0
ANNUAL OPERATING AND MAINTENANCE COSTS	
TOTAL ANNUAL COSTS	\$0
REPLACEMENT COSTS	
TOTAL REPLACEMENT COSTS	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above)	\$0
Present Worth Annual O&M Costs	\$0
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$0

(1) The No Action alternative for Area 9/10 soils is a true "no-action" - no additional measures, which incur cost, will be taken for this alternative.

TABLE 7-9
 ALTERNATIVE SCS-9/10A: NO-ACTION ⁽¹⁾
 DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
NONE	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(1) The No Action alternative for Area 9/10 soils is a true "no-action" - no additional measures, which incur cost, will be taken for this alternative.

TABLE 7-9
ALTERNATIVE SCS-9/10A: NO-ACTION ⁽¹⁾
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT		COMMENTS
NONE	N/A	

(1) The No Action alternative for Area 9/10 soils is a true "no-action" - no additional measures, which incur cost, will be taken for this alternative.

TABLE 7-11
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 9/10
ALTERNATIVE SCS-9/10B: LIMITED ACTION - DEED RESTRICTIONS
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
Deed Restrictions (land use)	\$25,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$25,000
Bid and Scope Contingency (10%)	\$2,500
TOTAL CAPITAL COSTS	\$28,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
None	
TOTAL ANNUAL COSTS	\$0
REPLACEMENT COSTS	
None	
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$28,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$0
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$28,000

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.

TABLE 7-10
ALTERNATIVE SCS-9/10B: LIMITED ACTION - DEED RESTRICTIONS
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Construction/		Annual O&M	Start-up &
				Capital Cost	Installation Costs		
				\$25,000			
legal fees				\$25,000			

TABLE 7-10
ALTERNATIVE SCS-9/10B: LIMITED ACTION - DEED RESTRICTIONS
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
legal fees	Based on CDM experience

TABLE 7-12
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 9/10
ALTERNATIVE SCS-9/10C: SOIL VAPOR EXTRACTION (SVE)
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
General	\$3,000
Soil Vapor Extraction (w/ emission controls)	\$158,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$161,000
Bid Contingency (10%)	\$16,000
Scope Contingency (10%)	\$16,000
Engineering and Design (15%)	\$24,000
Oversight/Health and Safety (5%)	\$8,000
TOTAL CAPITAL COSTS	\$225,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$18,000
Regular System Maintenance/Electrical	\$164,000
Post Treatment Sampling	\$147,000
TOTAL ANNUAL COSTS	\$329,000
REPLACEMENT COSTS	
None	
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$225,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$4,083,000
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$4,308,000

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 9/10
 ALTERNATIVE SCS-9/10C: SOIL VAPOR EXTRACTION (SVE)
 DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
Construction Costs							
construction trailer (rental and delivery)	mo	1	\$3,300			\$3,300	
mobilization	ls	1	\$1,000	\$1,000			
demobilization	1s	1	\$1,000	\$1,000			
decon facilities	ea	1	\$1,000	\$1,000			
health and safety equipment	yr	1	\$9,000			\$9,000	
electrical power service supply	yr	1	\$3,600			\$3,600	
water supply	yr	1	\$2,400			\$2,400	
Operating Costs							
SVE well installation	ea	4	\$6,000		\$24,000		
SVE main system	unit	1	\$18,000	\$18,000	\$6,000	\$10,000	
SVE control panels	unit	1	\$3,000	\$3,000	\$1,500	\$500	
6" carbon steel piping	ft	720	\$57	\$41,040			
4" carbon steel piping	ft	50	\$32	\$1,600			
excavation for piping placement	ft	770	\$0.67		\$516		
electrical power requirements (25 HP)	ls	1	\$25,000			\$25,000	
SVE treatment building	sf	500	\$100	\$50,000	included		
air/water separator tank	ls	1	\$5,000	\$5,000		\$500	
activated carbon emissions treatment	ls	1	\$7,500	\$7,500		\$1,000	
activated carbon recharge (1,600 lb recharge)	year	30	\$1,640			\$49,200	
activated carbon disposal	year	30	\$2,190			\$65,700	
Sampling	ea	8	\$1,500			\$12,000	
Post Treatment Costs							
Test Kits/ Field Screening (per year)	samples	34	\$300			\$10,200	
Laboratory Analysis (VOCs, N, P) (per year)	samples	672	\$200			\$134,400	
shipping and handling (per year)	shipmt	24	\$100			\$2,400	

(1) All Post Treatment Sampling costs are presented in costs per number of samples and shipments required per year - costs are presented as annual O&M costs

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 9/10
ALTERNATIVE SCS-9/10C: SOIL VAPOR EXTRACTION (SVE)
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
Construction Trailer and Mobilization	
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.85/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
Soil Vapor Extraction (SVE) System	
SVE well installation	Cost associated with installation of SVE wells. Based on CDM experience.
SVE main system	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mnting, interconnecting piping and a manual motor start switch
SVE control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel piping	based on CDM experience
4" carbon steel piping	based on CDM experience
excavation for piping placement	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power requirements (25 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
SVE treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
air/water separator tank	Based on CDM experience
activated carbon emissions treatment	Based on estimate from Carbtrol (6/98) for a G-7 Absorber carbon unit w/ 1600 lbs of vapor phase activated carbon designed for 2000 cfm flows.
activated carbon recharge (1,600 lb unit)	Based on carbon use of 3 lb/day and 365 days/yr, rate of \$1.50/lb carbon recharge
activated carbon disposal	Based on carbon used per 365 day/year; disposal at a rate of \$2.00 per lb carbon disposed
Sampling	Based on CDM experience
Test Kits/Field Screening	
Test Kits/ Field Screening (per year)	Based on CDM experience and average test kit costs - ~25 samples per test kit; samples collected on a grid of 1 sample/250 cy contam. mat'l; 1 sampling grid per 2 weeks
Laboratory Analysis (VOCs, N, P) (per year)	Based on 1998 sample analysis costs from Midwest laboratories; samples collected on a grid of 1 sample/250cy contam. material; 1 sampling grid per month (including QA/QC samples)
shipping and handling (per year)	Costs associated with transporting samples from site to laboratory twice per month

**TABLE 7-13
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY**

**SOURCE AREA 11
ALTERNATIVE SCS-11A: NO-ACTION ⁽¹⁾
COST SUMMARY**

Item/Description	Total Cost
CAPITAL COSTS	
TOTAL CAPITAL COSTS	\$0
ANNUAL OPERATING AND MAINTENANCE COSTS	
TOTAL ANNUAL COSTS	\$0
REPLACEMENT COSTS	
TOTAL REPLACEMENT COSTS	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above)	\$0
Present Worth Annual O&M Costs	\$0
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$0

(1) The No Action alternative for Area 11 soils is a true "no-action" - no additional measures, which incur cost, will be taken for this alternative.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 11
 ALTERNATIVE SCS-11A: NO-ACTION ⁽¹⁾
 DETAILED COST ESTIMATE

				Construction/ Installation		Annual O&M	Start-up & Baseline
COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Costs	Costs	Costs
NONE	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(1) The No Action alternative for Area 11 soils is a true "no-action" - no additional measures, which incur cost, will be taken for this alternative.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 11

ALTERNATIVE SCS-11A: NO-ACTION ⁽¹⁾

DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT		COMMENTS
NONE	N/A	

(1) The No Action alternative for Area 11 soils is a true "no-action" - no additional measures, which incur cost, will be taken for this alternative

TABLE 7-14
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 11
ALTERNATIVE SCS-11B: LIMITED ACTION - DEED RESTRICTIONS
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
Deed Restrictions (land use)	\$25,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$25,000
Bid and Scope Contingency (10%)	\$2,500
TOTAL CAPITAL COSTS	\$28,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
None	
TOTAL ANNUAL COSTS	\$0
REPLACEMENT COSTS	
None	
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$28,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$0
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$28,000

- (1) Capital costs for construction items do not include oversight fees, which are accounted for separately.
(2) Replacement costs include construction and oversight capital costs.
(3) Capital costs represent the present worth of the given alternative.
(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 11
 ALTERNATIVE SCS-11B: LIMITED ACTION - DEED RESTRICTIONS
 DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation	Annual O&M	Start-up & Baseline
					Costs	Costs	Costs
				\$25,000			
legal fees				\$25,000			

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 11
ALTERNATIVE SCS-11B: LIMITED ACTION - DEED RESTRICTIONS
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT		COMMENTS
Deed Restrictions (cont'd)		
legal fees	Based on CDM experience	

TABLE 7-15
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 11
ALTERNATIVE SCS-11C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
General	\$3,000
Soil Vapor Extraction (with emission controls)	\$242,000
Catalytic Oxidation System	\$143,500
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$388,500
Bid Contingency (10%)	\$39,000
Scope Contingency (10%)	\$39,000
Engineering and Design (15%)	\$58,000
Oversight/Health and Safety (5%)	\$19,000
TOTAL CAPITAL COSTS	\$543,500
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$18,000
Regular System Maintenance/Electrical	\$36,000
Catalytic Oxidation System Maintenance	\$68,880
Post Treatment Sampling	\$90,000
TOTAL ANNUAL COSTS	\$212,880
REPLACEMENT COSTS	
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$543,500
Present Worth Annual O&M Costs ⁽⁴⁾	\$2,642,000
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$3,185,500

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.

Note: SVE present worth costs are based on 30 year operation.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 11
ALTERNATIVE SCS-11C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
GENERAL				\$3,000	\$0	\$18,300	\$0
construction trailer (rental and delivery)	yr	1	\$3,300			\$3,300	
mobilization	ls	1	\$1,000	\$1,000			
demobilization	ls	1	\$1,000	\$1,000			
decon facilities	ea	1	\$1,000	\$1,000			
health and safety equipment	yr	1	\$9,000			\$9,000	
electrical power service supply	yr	1	\$3,600			\$3,600	
water supply	yr	1	\$2,400			\$2,400	
SOIL VAPOR EXTRACTION (SVE)				\$203,895	\$37,025	\$38,000	
SVE well installation	ea	5	\$6,000		\$30,000		
SVE main system	unit	1	\$18,000	\$18,000	\$6,000	\$10,000	
SVE control panels	unit	1	\$3,000	\$3,000	\$1,500	\$500	
6" carbon steel piping	ft	535	\$57	\$30,495			
4" carbon steel piping	ft	100	\$32	\$3,200			
excavation for piping placement	ft	635	\$0.67		\$425		
electrical power requirements (25 HP)	ls	1	\$25,000			\$25,000	
SVE treatment building	sf	800	\$180	\$144,000	included		
air/water separator tank	ls	1	\$5,000	\$5,000		\$500	
CATALYTIC OXIDATION (CO)				\$143,500	\$0	\$68,500	\$0
Catalytic Oxidation Unit	ls	1	\$143,500	\$143,500	included	\$10,000	
Natural Gas	ls	1	\$12,000			\$12,000	
Catalyst Replacement	ea	9	\$9,600			\$2,880	
Sampling	ea	8	\$5,500			\$44,000	
POST TREATMENT SAMPLING				\$0	\$0	\$80,300	\$0
Test Kits/ Field Screening (per year)	samples	33	\$300			\$9,900	
Laboratory Analysis (VOCs, N, P) (per year)	samples	390	\$200			\$78,000	
shipping and handling (per year)	shipmt	24	\$100			\$2,400	

(1) All Post Treatment Sampling costs are presented in costs per number of samples and shipments required per year - costs are presented as annual O&M costs

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 11
 ALTERNATIVE SCS-11C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION
 DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
General	
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
Soil Vapor Extraction (SVE)	
SVE well installation	Cost associated with installation of SVE wells. Based on CDM experience.
SVE main system	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mnting, interconnecting piping and a manual motor start switch
SVE control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel piping	based on CDM experience
4" carbon steel piping	based on CDM experience
excavation for piping placement	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power requirements (40 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
SVE treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
air/water separator tank	Based on CDM experience
catalytic oxidizer/thermal treatment	Based on vendor estimates
Catalytic Oxidation (CO)	
Catalytic Oxidation Unit	Vendor estimate - Global Technologies, Inc. (May 2000)
Natural Gas	Vendor estimate - Global Technologies, Inc. (May 2000)
Catalyst Replacement	Vendor estimate - Global Technologies, Inc. (May 2000)
Sampling	Based on CDM experience
Other Monitoring Activities	
Test Kits/ Field Screening (per year)	Based on CDM experience and average test kit costs - ~25 samples per test kit; samples collected on a grid of 1 sample/250 cy contam. mat'l, 1 sampling grid per 2 weeks
Laboratory Analysis (VOCs, N, P) (per year)	Based on 1998 sample analysis costs from Midwest laboratories; samples collected on a grid of 1 sample/250cy contam. material; 1 sampling grid per month (including QA/QC samples)
shipping and handling (per year)	Costs associated with transporting samples from site to laboratory twice per month

TABLE 7-16

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FOCUSED FEASIBILITY STUDY**

**SOURCE AREA 4 - LEACHATE
ALTERNATIVE SCL-4A: NO ACTION / LEACHATE MONITORING/ RESTRICTIONS
ON GROUNDWATER USAGE/ NATURAL ATTENUATION
COST SUMMARY**

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
Leachate Monitoring Wells	\$18,000
SUBTOTAL CONSTRUCTION COSTS	\$43,000
Bid and Scope Contingency (20%)	\$9,000
Oversight/Health and Safety (5%)	\$2,000
TOTAL CAPITAL COSTS ⁽¹⁾	\$54,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
Leachate Sampling and Analysis (per event)	\$7,000
TOTAL ANNUAL COSTS	\$7,000
REPLACEMENT COSTS ⁽²⁾	
Monitoring Well Replacement (every 15 years)	\$29,000
TOTAL REPLACEMENT COSTS	\$29,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$54,000
Present Worth Annual O&M Costs ⁽⁴⁾	
Leachate Sampling	
Quarterly Sampling - years 1 and 2	\$52,000
Semi-annual Sampling - years 3 through 30	\$149,000
Present Worth Replacement Costs ⁽⁵⁾	\$14,000
TOTAL PRESENT WORTH	\$269,000

(1) Capital costs for construction items do not include oversight fees.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) The "Present Worth Annual O&M Cost" line item includes all annual costs except for costs per sampling and analysis event. Costs incurred for sampling and analysis are broken down per sampling schedule as listed. Sampling and analysis costs are based on a 7% discount rate over a 30 year projection (Based on RCRA Closure Guidelines).

(5) Present worth of replacement costs is based on a 7% annual discount rate and replacement of monitoring wells replacement every 15 years.

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
SOURCE AREA 4 - LEACHATE**

**ALTERNATIVE SCL-4A: NO ACTION / LEACHATE MONITORING/ RESTRICTIONS ON GROUNDWATER USAGE/ NATURAL ATTENUATION
DETAILED COST ESTIMATE**

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
Legal Fees	ls	1	\$25,000	\$25,000			
well installation and materials	well	4	\$4,500		\$18,000		
labor	hours	40	\$60			\$2,400	
vehicle	day	2	\$60			\$120	
equipment	ls	1	\$600			\$600	
miscellaneous	ls	1	\$1,000			\$500	
leachate laboratory analysis	each	8	\$380			\$3,040	

⁽¹⁾ The monitoring schedule over 30 years was assumed as:

Years 1,2 = quarterly sampling; Years 3 through 30= semi-annual sampling (Based on RCRA Closure Guidelines)

These costs are incorporated in each alternative's cost summary under "Annual Operation and Maintenance."

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
 SOURCE AREA 4 - LEACHATE
 ALTERNATIVE SCL-4A: NO ACTION / LEACHATE MONITORING/ RESTRICTIONS ON GROUNDWATER USAGE/ NATURAL ATTENUATION
 DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
Groundwater Use Restriction	
legal fees	Cost based on CDM experience
well installation and materials	Cost based on CDM experience in monitoring well installation
labor	Based on 10 hour work day at the average CDM labor rate of \$60 for oversite personnel
vehicle	Based on \$60/day rental fee for a field vehicle
equipment	Based on CDM equipment rental rates
miscellaneous	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
leachate laboratory analysis	Based on average cost incurred for VOCs and bioparameters. One duplicate and one blank will be collected per 10 samples

TABLE 7-17

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
FOCUSED FEASIBILITY STUDY
ROCKFORD, ILLINOIS

AREA 4 - LEACHATE
ALTERNATIVE SCL-4B: LIMITED ACTION / LEACHATE MONITORING / LEACHATE
COLLECTION AND TREATMENT BY AIR STRIPPING UNIT / OFF-SITE SURFACE
WATER DISCHARGE / GROUNDWATER USE RESTRICTIONS
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
Leachate Containment System	\$118,000
Leachate Monitoring Wells	\$18,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$161,000
Bid Contingency (15%)	\$24,000
Scope Contingency (20%)	\$32,000
Engineering and Design (15%)	\$24,000
Oversight/Health and Safety (5%)	\$8,000
TOTAL CAPITAL COSTS	\$249,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
Leachate Containment System	\$7,000
Leachate Containment System Sampling and Analysis (per event)	\$4,000
Leachate Sampling and Analysis (per event)	\$5,000
TOTAL ANNUAL COSTS	\$16,000
REPLACEMENT COSTS ⁽²⁾	
Leachate Containment System (every 15 years)	\$78,000
Monitoring Well Replacement (every 15 years)	\$29,000
TOTAL REPLACEMENT COSTS	\$107,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$249,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$87,000
Leachate Containment System	
Quarterly Sampling - years 1 through 30	\$200,000
Leachate Monitoring Wells	
Quarterly Sampling - years 1 and 2	\$37,000
Semi-annual Sampling - years 3 through 30	\$106,000
Present Worth Replacement Costs ⁽⁵⁾	\$53,000
TOTAL PRESENT WORTH	\$732,000

(1) Capital costs for construction items do not include oversight fees.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) The "Present Worth Annual O&M Cost" line item includes all annual costs except for costs per sampling and analysis event. Costs incurred for sampling and analysis are broken down per sampling schedule as listed. Sampling and analysis costs are based on a 7% discount rate over a 30 year projection (Based on RCRA Closure Guidelines).

(5) Present worth of replacement costs is based on a 7% annual discount rate and replacement of monitoring wells replacement and leachate collection system (including extraction wells, piping, pumps, and air stripping unit) every 15 years.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT

AREA 4 - LEACHATE

**ALTERNATIVE SCL-4B: LIMITED ACTION / LEACHATE MONITORING / LEACHATE COLLECTION AND TREATMENT BY AIR STRIPPING
UNIT / OFF-SITE SURFACE WATER DISCHARGE / GROUNDWATER USE RESTRICTIONS
DETAILED COST ESTIMATE**

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
Groundwater Use Restrictions				\$25,000			
Legal Fees	ls	1	\$25,000	\$25,000			
Leachate Collection and Treatment				\$90,720	\$26,800	\$7,000	\$0
mobilization/demobilization	ls	1	\$9,000	\$9,000			
treatment building	ft ²	400	\$100	\$40,000			
electrical supply	ls	1	\$5,000	\$5,000			
extraction well installation	well	4	\$5,800		\$23,200		
pump materials and installation	pump	8	\$1,180	\$7,080	\$600	\$2,000	
4" dia. carbon steel header pipe	feet	20	\$32	\$640			
6" dia. carbon steel header to air stripper pipe	feet	150	\$57	\$8,550			
air stripping treatment unit installation and materials	ls	1	\$15,500	\$15,500	\$3,000	\$5,000	
6" carbon steel air stripping unit discharge pipe	feet	200	\$25	\$5,000			
extraction well installation	well	4	\$4,500		\$18,000		
well installation and materials	well	4	\$4,500		\$18,000		
Leachate Monitoring and Maintenance				\$0	\$0	\$3,780	\$0
labor	hours	10	\$60			\$600	
vehicle	day	1	\$60			\$60	
equipment	ls	1	\$600			\$600	
miscellaneous	ls	1	\$1,000			\$500	
leachate treatment system laboratory analysis	each	2	\$1,000			\$2,000	
Leachate Monitoring and Maintenance				\$0	\$0	\$4,660	\$0
labor	hours	40	\$60			\$2,400	
vehicle	day	2	\$60			\$120	
equipment	ls	1	\$600			\$600	
miscellaneous	ls	1	\$1,000			\$500	
leachate laboratory analysis	each	8	\$130			\$1,040	

Total Project Costs: \$215,720

⁽¹⁾ The monitoring schedule over 30 years was assumed as

Years 1,2 = quarterly sampling Years 3 through 30= semi-annual sampling (Based on RCRA Closure Guidelines)

These costs are incorporated in each alternative's cost summary under "Annual Operation and Maintenance"

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT

AREA 4 - LEACHATE

**ALTERNATIVE SCL-4B: LIMITED ACTION / LEACHATE MONITORING / LEACHATE COLLECTION AND TREATMENT BY AIR STRIPPING UNIT / OFF-SITE SURFACE WATER DISCHARGE / GROUNDWATER USE RESTRICTIONS
DETAILED COST ESTIMATE - COMMENTS**

COST COMPONENT	COMMENTS
Legal fees	Cost based on CDM experience
mobilization/demobilization for all treatment building electrical supply	Cost based on CDM experience Based on a 20 foot x 20 foot building - cost based on Means Building Construction Cost Data
extraction well installation	Based on CDM experience 4" diameter, stainless steel construction, 35 foot depth with 10 foot screen - cost based on CDM experience of average extraction well installation costs
pump installation	1 pump per well (2 spare) @ 1.2 to 7 gpm flow with/control box each pump - costs based on April 1998 Grundfos cost estimate
4" dia. well connected to main pipe	4" diameter carbon steel pipe, 10 foot linkages from each of the 4 wells to treatment unit (with 15% contingency) - cost based on CDM experience
6" dia. pipe connected to air stripping unit	4" diameter carbon steel pipe, header pipe (with 15% contingency) for connection between each well and leachate treatment unit - cost based on CDM experience
air stripping treatment unit	Shallow Tray air stripper model 1321 with options - cost based on April 1998 North East Environmental Products, Inc. cost estimate
leachate discharge pipe	6" diameter carbon steel pipe, 10 foot linkages from treatment unit to off-site surface water discharge (with 15% contingency) - cost based on CDM experience
well installation and materials	Cost based on CDM experience in monitoring well installation
labor	Based on 10 hour work day at the average CDM labor rate of \$60 for onsite personnel
vehicle	Based on \$60/day rental fee for a field vehicle
equipment	Based on CDM equipment rental rates
miscellaneous	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
leachate treatment system laboratory analysis	Based on average cost incurred for priority pollutants analysis; One duplicate and one blank will be collected per 10 samples.
labor	Based on 10 hour work day at the average CDM labor rate of \$60 for onsite personnel
vehicle	Based on \$60/day rental fee for a field vehicle
equipment	Based on CDM equipment rental rates
miscellaneous	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
leachate laboratory analysis	Based on average cost incurred for VOCs; One duplicate and one blank will be collected per 10 samples

TABLE 7-18
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FOCUSED FEASIBILITY STUDY

AREA 4 - LEACHATE
ALTERNATIVE SCL-4C: AIR SPARGING ALONG GMZ BOUNDARY/ LEACHATE MONITORING /
GROUNDWATER USE RESTRICTIONS
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
General	\$1,038,000
VRS	\$180,000
Air Sparging	\$62,000
Leachate Monitoring Wells	\$9,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$1,314,000
Bid Contingency (10%)	\$197,000
Scope Contingency (20%)	\$263,000
Engineering and Design (15%)	\$197,000
Oversight/Health and Safety (5%)	\$66,000
TOTAL CAPITAL COSTS	\$2,037,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
VRS Maintenance/Electrical	\$26,000
Leachate Sampling and Analysis (per sample event)	\$5,000
Air Sparging System Maintenance/Electrical	\$26,000
TOTAL ANNUAL COSTS	\$57,000
REPLACEMENT COSTS	
Leachate Monitoring Wells (every 15 years)	\$29,000
Equipment Replacement (e.g., motors, blowers) - every 15 years	\$10,000
TOTAL REPLACEMENT COSTS ⁽²⁾	\$39,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$2,037,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$323,000
Quarterly Sampling - years 1 and 2	\$37,000
Semi-annual Sampling - years 3 through 30	\$106,000
Present Worth Replacement Costs ⁽⁵⁾	\$19,000
TOTAL PRESENT WORTH	\$2,522,000

- (1) Capital costs for construction items do not include oversight fees, which are accounted for separately.
- (2) Replacement costs include construction and oversight capital costs.
- (3) Capital costs represent the present worth of the given alternative.
- (4) The "Present Worth Annual O&M Cost" line item includes all annual costs except for costs per sampling and analysis event. Costs incurred for sampling and analysis are broken down per sampling schedule as listed. Sampling and analysis costs are based on a 7% discount rate over a 30 year projection (Based on RCRA Closure Guidelines).
- (5) Present worth of replacement costs is based on a 7% annual discount rate and replacement of system equipment and monitoring wells every 15 years (twice over 30 year projection).

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
AREA 4 - LEACHATE
ALTERNATIVE SCL-4C: AIR SPARGING ALONG GMZ BOUNDARY/ LEACHATE MONITORING / GROUNDWATER USE RESTRICTIONS
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
<i>Legal Fees</i>	ls	1	\$25,000	\$25,000			
<i>construction trailer (rental and delivery)</i>	mo	360	\$275	\$99,000			
<i>mobilization</i>	ls	1	\$1,000	\$1,000			
<i>demobilization</i>	ls	1	\$1,000	\$1,000			
<i>decon facilities</i>	ea	1	\$1,000	\$1,000			
<i>health and safety equipment</i>	mo	360	\$2,000	\$720,000			
<i>electrical power service supply</i>	mo	360	\$400	\$144,000			
<i>water supply</i>	mo	360	\$200	\$72,000			
<i>well installation and materials</i>	well	2	\$4,500		\$9,000		
<i>VRS well installation</i>	ea.	3	\$6,000		\$18,000		
<i>VRS main system</i>	ls	1	\$14,000	\$14,000	\$5,000	\$10,000	
<i>VRS control panels</i>	ls	1	\$3,000	\$3,000	\$1,000	\$500	
<i>6" carbon steel piping</i>	ft	120	\$57	\$6,840			
<i>4" carbon steel piping</i>	ft	225	\$32	\$7,200			
<i>excavation for piping placement</i>	ft	345	\$0.67		\$231		
<i>electrical power requirements (10 HP)</i>	yr.	1	\$10,000			\$10,000	
<i>VRS treatment building</i>	sf	400	\$100	\$40,000	included		
<i>air/water separator tank</i>	ls	1	\$5,000	\$5,000		\$1,000	
<i>catalytic oxidation of emission</i>	ls	1	\$80,000	\$80,000	included	\$4,000	
<i>AS well installation</i>	ea	6	\$6,000		\$36,000		
<i>AS main system</i>	ls	1		\$4,000	\$1,000	\$1,000	
<i>AS control panels</i>	ls	1		\$3,000	\$1,000	\$500	
<i>6" carbon steel piping</i>	ft	120	\$57	\$6,840			
<i>4" carbon steel piping</i>	ft	310	\$32	\$9,920			
<i>excavation for piping placement</i>	ft	430	\$0.67		\$288		
<i>electrical power requirements (15 HP)</i>	year	1	\$15,000			\$15,000	
<i>AS treatment building</i>	Costs for AS treatment building included with corresponding VRS						
<i>air/water separator tank</i>	Costs for air/water separator tank included with corresponding VRS						
<i>catalytic oxidized thermal treatment</i>	Costs for thermal air treatment included with corresponding VRS						
<i>air collection and treatment</i>	Cost for collection and treatment included with corresponding VRS						
<i>labor</i>	hours	40	\$60			\$2,400	
<i>vehicle</i>	day	2	\$60			\$120	
<i>equipment</i>	ls	1	\$600			\$600	
<i>miscellaneous</i>	ls	1	\$1,000			\$500	
<i>leachate laboratory analysis</i>	each	8	\$130			\$1,040	

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
 AREA 4 - LEACHATE
 ALTERNATIVE SCL-4C: AIR SPARGING ALONG GMZ BOUNDARY/ LEACHATE MONITORING / GROUNDWATER USE RESTRICTIONS
 DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
Groundwater Use Restrictions	
legal fees	Cost based on CDM experience
Construction	
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
Leachate Monitoring	
well installation and materials	Cost based on CDM experience in monitoring well installation
Volatile Organic Compound (VOC) Monitoring	
VRS well installation	Cost associated with installation of SVE wells. Based on CDM experience
VRS main system	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mnting, interconnecting piping and a manual motor start switch
VRS control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel pipe	based on CDM experience
4" carbon steel pipe	based on CDM experience
excavation for piping placement (5 foot depth)	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power requirements (10 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
VRS treatment building	Basic prefabricated building on concrete pad. Based on CDM experience
air/water separator tank	Based on CDM experience
catalytic oxidizer/thermal treatment	Based on CDM experience
Air Sparging (AS)	
AS well installation	Cost associated with installation of AS wells. Based on CDM experience
AS main system	Vendor: includes blower, exp motor, inline silencer, pressure relief valve, unitized base, pressure gauge and a manual motor starting switch.
AS control panels	Vendor estimate
6" carbon steel piping	Based on CDM experience
4" carbon steel piping	Based on CDM experience
excavation for piping placement	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power requirements (15 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
AS treatment building	Costs for AS treatment building included with corresponding VRS
air/water separator tank	Costs for air/water separator tank included with corresponding VRS
catalytic oxidizer/thermal treatment	Costs for thermal air treatment included with corresponding VRS
air collection and treatment	Cost for collection and treatment of air included with corresponding VRS
Leachate Monitoring Laboratory	
labor	Based on 10 hour work day at the average CDM labor rate of \$60 for oversight personnel
vehicle	Based on \$60/day rental fee for a field vehicle
equipment	Based on CDM equipment rental rates
miscellaneous	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
leachate laboratory analysis	Based on average cost incurred for volatile organic compound analysis. One duplicate and one blank will be collected per 10 samples.

TABLE 7-19

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
FOCUSED FEASIBILITY STUDY
ROCKFORD, ILLINOIS**

AREA 4 - LEACHATE

**ALTERNATIVE SCL-4D: REACTIVE BARRIER WALL / LEACHATE MONITORING /
GROUNDWATER USE RESTRICTIONS
COST SUMMARY**

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
Reactive Barrier Wall	\$3,580,000
Leachate Monitoring Wells	\$45,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$3,650,000
Bid Contingency (15%)	\$548,000
Scope Contingency (20%)	\$730,000
Engineering and Design (15%)	\$548,000
Oversight/Health and Safety (5%)	\$183,000
TOTAL CAPITAL COSTS	\$5,659,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
Leachate Sampling and Analysis (per event)	\$7,000
TOTAL ANNUAL COSTS	\$7,000
REPLACEMENT COSTS ⁽²⁾	
Iron Rejuvenation	\$25,000
Monitoring Well Replacement (every 15 years)	\$58,000
TOTAL REPLACEMENT COSTS	\$83,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$5,659,000
Present Worth Annual O&M Costs ⁽²⁾	
Quarterly Sampling - years 1 and 2	\$52,000
Semi-annual Sampling - years 3 through 30	\$149,000
Present Worth Replacement Costs ⁽³⁾	\$51,000
TOTAL PRESENT WORTH	\$5,911,000

(1) Replacement costs include construction and oversight capital costs.

(2) Capital costs represent the present worth of the given alternative.

(4) The "Present Worth Annual O&M Cost" line item includes all annual costs except for costs per sampling and analysis event. Costs incurred for sampling and analysis are broken down per sampling schedule as listed. Sampling and analysis costs are based on a 7% discount rate over a 30 year projection (Based on RCRA Closure Guidelines).

(3) Present worth of replacement costs is based on a 7% annual discount rate and replacement of monitoring wells every 15 years and Iron rejuvenation every 10 years (three times over 30 year projection).

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
 AREA 4 - LEACHATE
 ALTERNATIVE SCL-4D: REACTIVE BARRIER WALL / LEACHATE MONITORING / GROUNDWATER USE RESTRICTIONS
 DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
Groundwater Use Restriction				\$25,000			
legal fees	ls	1	\$25,000	\$25,000			
gate installation	ft ²	18,000	\$150	\$840,000	\$2,700,000	\$0	\$0
iron jetting well materials and installation	well	2	\$20,000		\$40,000		
well installation and materials	well	10	\$4,500		\$45,000		
labor	hours	60	\$60			\$3,600	
vehicle	day	3	\$60			\$180	
equipment	ls	1	\$600			\$600	
miscellaneous	ls	1	\$1,000			\$500	
leachate laboratory analysis	each	14	\$130			\$1,820	

Source: EPA (1991), RCRA, and RCRA Closure Guidelines.

(1) The monitoring schedule over 30 years was assumed as:

Years 1,2 = quarterly sampling; Years 3 through 30= semi-annual sampling (Based on RCRA Closure Guidelines)

These costs are incorporated in each alternative's cost summary under "Annual Operation and Maintenance."

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
 AREA 4 - LEACHATE
 ALTERNATIVE SCL-4D: REACTIVE BARRIER WALL / LEACHATE MONITORING / GROUNDWATER USE RESTRICTIONS
 DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
Groundwater Upgrading	
legal fees	Cost based on CDM experience
Monitoring Well Installation	
pipe installation	Cost based on CDM experience
iron	Cost based on CDM experience
setting well materials and installation	Cost based on CDM experience
Monitoring Well Construction	
well installation and materials	Cost based on CDM experience in monitoring well installation
Monitoring Well Operation	
labor	Based on 10 hour work day at the average CDM labor rate of \$60 for onsite personnel
vehicle	Based on \$300/week rental fee for a field vehicle
equipment	Based on CDM equipment rental rates
miscellaneous	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
leachate laboratory analysis	Based on average cost incurred for VOCs. One duplicate and one blank will be collected per 10 samples

TABLE 7-20
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FOCUSED FEASIBILITY STUDY

AREA 4 - LEACHATE
ALTERNATIVE SCL-4E: AIR SPARGING ALONG GMZ BOUNDARY AND SOURCE AREA /
LEACHATE MONITORING / GROUNDWATER USE RESTRICTIONS
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
General	\$1,038,000
VRS	\$312,000
Air Sparging	\$104,000
Leachate Monitoring Wells	\$9,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$1,488,000
Bid Contingency (15%)	\$223,000
Scope Contingency (20%)	\$298,000
Engineering and Design (15%)	\$223,000
Oversight/Health and Safety (5%)	\$74,000
TOTAL CAPITAL COSTS	\$2,306,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
Leachate Sampling and Analysis (per sample event)	\$5,000
VRS Regular System Maintenance/Electrical	\$26,000
Air Sparging Regular System Maintenance/Electrical	\$26,000
TOTAL ANNUAL COSTS	\$57,000
REPLACEMENT COSTS	
Leachate Monitoring Wells (every 15 years)	\$29,000
Equipment Replacement (e.g., motors, blowers) - every 15 years	\$20,000
TOTAL REPLACEMENT COSTS ⁽²⁾	\$49,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$2,306,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$323,000
Quarterly Sampling - years 1 and 2	\$37,000
Semi-annual Sampling - years 3 through 30	\$106,000
Present Worth Replacement Costs ⁽⁵⁾	\$24,000
TOTAL PRESENT WORTH	\$2,796,000

- (1) Capital costs for construction items do not include oversight fees, which are accounted for separately
- (2) Replacement costs include construction and oversight capital costs.
- (3) Capital costs represent the present worth of the given alternative.
- (4) The "Present Worth Annual O&M Cost" line item includes all annual costs except for costs per sampling and analysis event. Costs incurred for sampling and analysis are broken down per sampling schedule as listed. Sampling and analysis costs are based on a 7% discount rate over a 30 year projection (Based on RCRA Closure Guidelines).
- (5) Present worth of replacement costs is based on a 7% annual discount rate and replacement of system equipment every 15 years (once over 30 year projection) and monitoring wells every 30 year

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
AREA 4 - LEACHATE
ALTERNATIVE SCL-4E: AIR SPARGING ALONG GMZ BOUNDARY AND SOURCE AREA / LEACHATE MONITORING / GROUNDWATER
USE RESTRICTIONS
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
legal fees	ls	1	\$25,000	\$25,000			
construction trailer (rental and delivery)	mo	360	\$275	\$99,000			
mobilization	ls	1	\$1,000	\$1,000			
demobilization	ls	1	\$1,000	\$1,000			
decon facilities	ea	1	\$1,000	\$1,000			
health and safety equipment	mo	360	\$2,000	\$720,000			
electrical power service supply	mo	360	\$400	\$144,000			
water supply	mo	360	\$200	\$72,000			
well installation and materials	well	2	\$4,500		\$9,000		
vapor recovery well installation	ea.	6	\$6,000		\$36,000		
vapor recovery main system	ls	1	\$14,000	\$14,000	\$5,000	\$10,000	
SVE control panels	ls	1	\$3,000	\$3,000	\$1,000	\$500	
6" carbon steel piping	lf	225	\$57	\$12,825			
4" carbon steel piping	lf	345	\$32	\$11,040			
excavation for piping placement	lf	570	\$0.67		\$382		
electrical power requirements (10 HP)	yr.	1	\$10,000			\$10,000	
vapor recovery treatment building	sf	800	\$180	\$144,000	included		
air/water separator tank	ls	1	\$5,000	\$5,000		\$1,000	
catalytic oxidation of emission	ls	1	\$80,000	\$80,000	included	\$4,000	
AS well installation	ea	10	\$8,000		\$80,000		
AS main system	ls	1	\$4,000	\$4,000	\$1,000	\$1,000	
AS control panels	ls	1	\$3,000	\$3,000	\$1,000	\$500	
6" carbon steel piping	lf	370	\$57	\$21,090			
4" carbon steel piping	lf	410	\$32	\$13,120			
excavation for piping placement	lf	780	\$0.67		\$523		
electrical power requirements (15 HP)	year	1	\$15,000			\$15,000	
AS treatment building	Costs for AS treatment building included with VRS						
air/water separator tank	Costs for air/water separator tank included with corresponding VRS						
catalytic oxidation/thermal treatment	Costs for thermal air treatment included with corresponding VRS						
labor	hours	40	\$60			\$2,400	
vehicle	day	2	\$60			\$120	
equipment	ls	1	\$800			\$800	
miscellaneous	ls	1	\$1,000			\$500	
leachate laboratory analysis	each	8	\$130			\$1,040	

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
 AREA 4 - LEACHATE
 ALTERNATIVE SCL-4E: AIR SPARGING ALONG GMZ BOUNDARY AND SOURCE AREA / LEACHATE MONITORING / GROUNDWATER
 USE RESTRICTIONS
 DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
<i>legal fees</i>	Cost based on CDM experience
<i>construction trailer (rental and delivery)</i>	50'x12' construction trailer - \$1.85/mi delivery fee (100mi) - rental allowance per 1996 Means
<i>mobilization</i>	Heavy equipment and trailers, per vendor estimate
<i>demobilization</i>	Allowance for trailer and equipment demobilization
<i>decon facilities</i>	Based on level of personal and vehicle decontamination anticipated for this alternative
<i>health and safety equipment</i>	Allowance based on CDM equipment rates
<i>electrical power service supply</i>	Based on expected electrical costs per month for this alternative
<i>water supply</i>	Based on expected use per month for this alternative (e.g., decon, personnel use)
<i>well installation and materials</i>	Cost based on CDM experience in monitoring well installation
<i>VRS well installation</i>	Cost associated with installation of SVE wells. Based on CDM experience.
	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mnting, interconnecting piping and a manual motor start switch
<i>VRS main system</i>	Vendor estimate - NEEP (May 1998)
<i>VRS control panels</i>	Vendor estimate - NEEP (May 1998)
<i>6" carbon steel pipe</i>	based on CDM experience
<i>4" carbon steel pipe</i>	based on CDM experience
<i>excavation for piping placement (5 foot depth)</i>	12" wide trench and backfill, 36" deep as per 1996 Means
<i>electrical power requirements (10 HP)</i>	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
<i>VRS treatment building</i>	Basic prefabricated building on concrete pad. Based on CDM experience.
<i>air/water separator tank</i>	Based on CDM experience
<i>catalytic oxidizer/thermal treatment</i>	Based on CDM experience
<i>AS well installation</i>	Cost associated with installation of AS wells. Based on CDM experience.
<i>AS main system</i>	Vendor: includes blower, exp motor, inline silencer, pressure relief valve, unitized base, pressure gauge and a manual motor starting switch.
<i>AS control panels</i>	Vendor estimate
<i>6" carbon steel piping</i>	Based on CDM experience
<i>4" carbon steel piping</i>	Based on CDM experience
<i>excavation for piping placement</i>	12" wide trench and backfill, 36" deep as per 1996 Means
<i>electrical power requirements (15 HP)</i>	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
<i>AS treatment building</i>	Costs for AS treatment building included with corresponding VRS
<i>air/water separator tank</i>	Costs for air/water separator tank included with corresponding VRS
<i>catalytic oxidizer/thermal treatment</i>	Costs for thermal air treatment included with VRS
<i>labor</i>	Based on 10 hour work day at the average CDM labor rate of \$60 for oversite personnel
<i>vehicle</i>	Based on \$60/day rental fee for a field vehicle
<i>equipment</i>	Based on CDM equipment rental rates
<i>miscellaneous</i>	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
<i>leachate laboratory analysis</i>	Based on average cost incurred for volatile organic compound analysis; One duplicate and one blank will be collected per 10 samples.

TABLE 7-21

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FOCUSED FEASIBILITY STUDY**

**SOURCE AREA 7 - LEACHATE
ALTERNATIVE SCL-7A: NO ACTION / LEACHATE MONITORING/ GROUNDWATER
USE RESTRICTIONS/ NATURAL ATTENUATION
COST SUMMARY**

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
Leachate Monitoring Wells	\$23,000
SUBTOTAL CONSTRUCTION COSTS	\$48,000
Bid Contingency (15%)	\$7,000
Scope Contingency (20%)	\$10,000
Oversight/Health and Safety (5%)	\$2,000
TOTAL CAPITAL COSTS	\$67,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
Leachate Sampling and Analysis (per event)	\$9,000
TOTAL ANNUAL COSTS	\$9,000
REPLACEMENT COSTS ⁽¹⁾	
Monitoring Well Replacement (every 15 years)	\$44,000
TOTAL REPLACEMENT COSTS	\$44,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽²⁾	\$67,000
Present Worth Annual O&M Costs	
Quarterly Sampling - years 1 and 2	\$67,000
Semi-annual Sampling - years 3 through 30	\$191,000
Present Worth Replacement Costs ⁽³⁾	\$22,000
TOTAL PRESENT WORTH	\$347,000

(1) Replacement costs include construction and oversight capital costs.

(2) Capital costs represent the present worth of the given alternative.

(3) Present worth of replacement costs is based on a 7% annual discount rate and replacement of monitoring wells every 30 years.

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
SOURCE AREA 7 - LEACHATE**

**ALTERNATIVE SCL-7A: NO ACTION / LEACHATE MONITORING/ GROUNDWATER USE RESTRICTIONS/ NATURAL ATTENUATION
DETAILED COST ESTIMATE**

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
CONSTRUCTION AND INSTALLATION				\$25,000			
legal fees	ls	1	\$25,000	\$25,000			
OPERATION AND MAINTENANCE							
well installation and materials	well	5	\$4,500		\$22,500		
ANNUAL OPERATION AND MAINTENANCE							
labor	hours	60	\$60			\$3,600	
vehicle	day	3	\$60			\$180	
equipment	ls	1	\$600			\$600	
miscellaneous	ls	1	\$1,000			\$500	
leachate laboratory analysis	each	11	\$380			\$4,180	

^m The monitoring schedule over 30 years was assumed as:

Years 1,2 = quarterly sampling; Years 3 through 30= semi-annual sampling (Based on RCRA Closure Guidelines)

These costs are incorporated in each alternative's cost summary under "Annual Operation and Maintenance."

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
SOURCE AREA 7 - LEACHATE

ALTERNATIVE SCL-7A: NO ACTION / LEACHATE MONITORING/ GROUNDWATER USE RESTRICTIONS/ NATURAL ATTENUATION
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
<i>legal fees</i>	Cost based on CDM experience
<i>well installation and materials</i>	Cost based on CDM experience in monitoring well installation
<i>labor</i>	Based on 10 hour work day at the average CDM labor rate of \$60 for onsite personnel
<i>vehicle</i>	Based on \$60/day rental fee for a field vehicle
<i>equipment</i>	Based on CDM equipment rental rates
<i>miscellaneous</i>	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
	Based on average cost incurred for VOCs and bioparameters; One duplicate and one blank will be
<i>leachate laboratory analysis</i>	collected per 10 samples.

TABLE 7-22

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
FOCUSED FEASIBILITY STUDY
ROCKFORD, ILLINOIS

AREA 7 - LEACHATE
ALTERNATIVE SCL-7B: MULTI-PHASE EXTRACTION/ COLLECT LEACHATE AND
TREAT BY AIR STRIPPING UNIT / DISCHARGE TO ON-SITE SURFACE WATER /
GROUNDWATER USE RESTRICTIONS/MONITORING
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
Leachate Containment System	\$322,000
Leachate Monitoring Wells	\$23,000
Multiphase Extraction in Source Areas	\$425,000
Multiphase Extraction Monitoring	\$44,000
Geophysical Survey	\$87,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$926,000
Bid Contingency (15%)	\$139,000
Scope Contingency (20%)	\$185,000
Engineering and Design (15%)	\$139,000
Oversight/Health and Safety (5%)	\$46,000
TOTAL CAPITAL COSTS	\$1,435,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
Leachate Containment System	\$35,000
Leachate Treatment System Sampling and Analysis (per sampling event)	\$4,000
Leachate Sampling and Analysis (per sampling event)	\$6,000
Multi-Phase Extraction in Source Areas	\$83,000
TOTAL ANNUAL COSTS	\$128,000
REPLACEMENT COSTS ⁽²⁾	
Leachate Containment System (every 15 years)	\$282,000
Monitoring Well Replacement (every 15 years)	\$44,000
TOTAL REPLACEMENT COSTS	\$326,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$1,435,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$652,000
Leachate Treatment System Sampling	
Quarterly Sampling - years 1 through 30	\$200,000
Leachate Sampling	
Quarterly Sampling - years 1 and 2	\$44,000
Semi-annual Sampling - years 3 through 30	\$145,000
Present Worth Replacement Costs ⁽⁵⁾	\$161,000
TOTAL PRESENT WORTH	\$2,637,000

(1) Capital costs for construction items do not include oversight fees.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) The "Present Worth Annual O&M Cost" line item includes all annual costs except for costs per sampling and analysis event. Costs incurred for sampling and analysis are broken down per sampling schedule as listed. Sampling and analysis costs are based on a 7% discount rate over a 30 year projection for the Leachate Containment System and over a 3 year projection for the Multi-Phase Extraction System (Based on RCRA Closure Guidelines).

(5) Present worth of replacement costs is based on a 7% annual discount rate and replacement of monitoring wells and leachate containment system (including central pump station, extraction wells, piping, pumps, and air stripping unit) every 15 years (twice over 30 year projection).

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
AREA 7 - LEACHATE
ALTERNATIVE SCL-7B: MULTI-PHASE EXTRACTION/ COLLECT LEACHATE AND TREAT BY AIR STRIPPING UNIT / DISCHARGE TO ON-SITE SURFACE WATER / GROUNDWATER USE RESTRICTIONS/MONITORING
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
Legal Fees	ls	1	\$25,000	\$25,000			
mobilization/demobilization	ls	1	\$5,000	\$5,000			
treatment building	ls	1	\$40,000	\$40,000			
electrical supply	ls	1	\$5,000	\$5,000			
extraction well materials and installation	well	8	\$6,000		\$48,000		
pump materials and installation	pump	10	\$2,000	\$20,000	\$1,000	\$2,500	
2" dia. carbon steel carbon steel pipe from well to header pipe	feet	160	\$25	\$4,000			
4" dia. carbon steel header pipe to Central Pump Station	feet	2,000	\$32	\$64,000			
Central Pump Station	ls	1	\$54,500	\$54,500		\$5,000	
4" dia. carbon steel pipe from Central Pump Station to air stripper unit	feet	300	\$32	\$9,600			
air stripping treatment unit and installation	unit	1	\$50,000	\$50,000	\$5,000	\$15,000	
Electricity	ls	1	\$12,000			\$12,000	
4" carbon steel discharge pipe to creek	feet	500	\$32	\$16,000			
well installation and materials	well	5	\$4,500		\$22,500		
labor	hours	10	\$60			\$600	
vehicle	day	1	\$60			\$60	
equipment	ls	1	\$600			\$600	
miscellaneous	ls	1	\$1,000			\$500	
leachate treatment system laboratory analysis	each	2	\$1,000			\$2,000	
labor	hour	60	\$60			\$3,600	
vehicle	day	3	\$60			\$180	
equipment	ls	1	\$600			\$600	
miscellaneous	ls	1	\$1,000			\$500	
leachate laboratory analysis	each	11	\$130			\$1,430	
Multi-Phase Wells (40 ft., 4 inch PVC with development)	each	10	\$8,000	\$80,000			
MPE System including enclosure	ls	1	\$200,000	\$200,000			
Piping (2 in. PVC @ 3 ft. bgs)	lf	2000	\$20	\$40,000			
Air Stripper System Expansion	ls	1	\$75,000	\$75,000			
Pilot Study	ls	1	\$50,000	\$50,000			
O&M Materials and Labor	ls	1	\$55,000			\$55,000	
Expanded Air Stripper O & M	ls	1	\$7,000			\$7,000	
Expanded Air Stripper / Catalytic Oxidation	ls	1	\$7,000			\$7,000	
Natural Gas	ls	1	\$14,000			\$14,000	
Multi-Phase Extraction Monitoring Wells	each	6	\$4,500	\$27,000			
Continuous Recorders for Multi-Phase MWEs	each	6	\$2,000	\$12,000			
Pressure Monitoring Points	each	9	\$500	\$4,500			
Mob/Demob	ls	1	\$2,000	\$2,000			
Per Diem	ls	1	\$5,000	\$5,000			
Gamma Ray Logs	well	9	\$175	\$1,575			
EM-39 Logs	well	9	\$175	\$1,575			
SIP and VIP off set Logging Stations	station	612	\$125	\$76,500			

⁽¹⁾ The monitoring schedule over 30 years was assumed as:

Years 1,2 = quarterly sampling; Years 3 through 30= semi-annual sampling (Based on RCRA Closure Guidelines)

These costs are incorporated in each alternative's cost summary under "Annual Operation and Maintenance."

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
AREA 7 - LEACHATE**

**ALTERNATIVE SCL-7B: MULTI-PHASE EXTRACTION/ COLLECT LEACHATE AND TREAT BY AIR STRIPPING UNIT / DISCHARGE TO ON-SITE
SURFACE WATER / GROUNDWATER USE RESTRICTIONS/MONITORING
DETAILED COST ESTIMATE - COMMENTS**

COST COMPONENT	COMMENTS
Groundwater Use Restrictions	
legal fees	Cost based on CDM experience
Leachate Treatment System	
mobilization/demobilization for all	Cost based on CDM experience
treatment building	Based on a 20 foot x 20 foot building - cost based on Butler Building April 1998 cost estimate
electrical supply	Based on CDM experience
extraction well installation	4" diameter, stainless steel construction, 35 foot depth with 10 foot screen - cost based on CDM experience of average extraction well installation costs.
pump materials installation	1 pump per well (2 spare) @ 1.2 to 7 gpm flow with/control box each pump - costs based on April 1998 Grundfos cost estimate
2" dia. carbon steel pipe from well to header pipe	2" diameter carbon steel pipe, 10 foot linkages from each of the 9 wells to treatment unit (with 15% contingency) - cost based on CDM experience
4" dia. carbon steel header pipe to Central Pump Station	4" diameter carbon steel pipe, 10 foot linkages from header pipe to Central Pumping Station (with 15% contingency) - cost based on CDM experience
Central Pump Station	Includes controls - cost based on CDM experience
4" dia. carbon steel pipe from Central Pump Station to air stripper unit	4" diameter carbon steel pipe, 10 foot linkages from Central Pumping Station to treatment unit (with 15% contingency) - cost based on CDM experience
air stripping treatment unit and installation	Shallow Tray air stripper model 2631 with options - cost based on April 1998 North East Environmental Products, Inc. cost estimate
Electricity	Based on Carbon Air cost estimate
4" discharge pipe to creek	4" diameter carbon steel pipe, 10 foot linkages from treatment unit to Creek (with 15% contingency) - cost based on CDM experience
Leachate Monitoring Wells	
well installation and materials	Cost based on CDM experience in monitoring well installation
Leachate Treatment System Laboratory Analysis	
labor	Based on 10 hour work day at the average CDM labor rate of \$60 for oversite personnel
vehicle	Based on \$60/day rental fee for a field vehicle
equipment	Based on CDM equipment rental rates
miscellaneous	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
leachate treatment system laboratory analysis	Based on average cost incurred for priority pollutants analysis; One duplicate and one blank will be collected per 10 samples.
Leachate Laboratory Analysis	
labor	Based on 10 hour work day at the average CDM labor rate of \$60 for oversite personnel
vehicle	Based on \$60/day rental fee for a field vehicle
equipment	Based on CDM equipment rental rates
miscellaneous	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
leachate laboratory analysis	Based on average cost incurred for volatile organic compound analysis; One duplicate and one blank will be collected per 10 samples.
Multi-Phase Extraction System	
Multi-Phase Wells (40 ft., 4 inch PVC with development)	Based on CDM experience
MPE System including enclosure	Based on Carbon Air cost estimate
Piping (2 in. PVC @ 3 ft. bgs)	Based on CDM experience
Air Stripper System Expansion	Based on Carbon Air cost estimate
Pilot Study	Based on CDM experience
O&M Materials and Labor	Based on Carbon Air cost estimate
Expanded Air Stripper O & M	Based on Carbon Air cost estimate
Expanded Air Stripper / Catalytic Oxidation	Based on Carbon Air cost estimate
Natural Gas	Based on CDM experience
Multi-Phase Extraction Monitoring Wells	
Multi-Phase Extraction Monitoring Wells	Based on CDM experience
Continuous Recorders for Multi-Phase MWE	Based on CDM experience
Pressure Monitoring Points	Based on CDM experience
Ground Truth Environmental	
Mob/Demob	Based on Ground Truth Environmental cost estimate
Per Diem	Based on Ground Truth Environmental cost estimate
Gamma Ray Logs	Based on Ground Truth Environmental cost estimate
EM-39 Logs	Based on Ground Truth Environmental cost estimate
SIP and VIP off set Logging Stations	Based on Ground Truth Environmental cost estimate

TABLE 7-23

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
FOCUSED FEASIBILITY STUDY
ROCKFORD, ILLINOIS**

**AREA 7 - LEACHATE
ALTERNATIVE SCL-7C: REACTIVE BARRIER WALL / LEACHATE USE
RESTRICTIONS
COST SUMMARY**

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
Reactive Barrier Wall	\$2,573,000
Leachate Monitoring Wells	\$50,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$2,648,000
Bid Contingency (15%)	\$397,000
Scope Contingency (20%)	\$530,000
Engineering and Design (15%)	\$397,000
Oversight/Health and Safety (5%)	\$132,000
TOTAL CAPITAL COSTS	\$4,104,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
Leachate Sampling and Analysis (per event)	\$8,000
TOTAL ANNUAL COSTS	\$8,000
REPLACEMENT COSTS ⁽¹⁾	
Iron Rejuvenation (every 10 years)	\$25,000
Monitoring Well Replacement (every 15 years)	\$72,000
TOTAL REPLACEMENT COSTS	\$97,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$4,104,000
Present Worth Annual O&M Costs ⁽²⁾	
Quarterly Sampling - years 1 and 2	\$59,000
Semi-annual Sampling - years 3 through 30	\$170,000
Present Worth Replacement Costs ⁽³⁾	\$58,000
TOTAL PRESENT WORTH	\$4,391,000

(1) Replacement costs include construction and oversight capital costs.

(2) Capital costs represent the present worth of the given alternative.

(3) Present worth of replacement costs is based on a 7% annual discount rate and replacement of monitoring wells every 15 years (twice over 30 year projection) and iron rejuvenation every 10 years (three times over 30 year projection).

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
 AREA 7 - LEACHATE
 ALTERNATIVE SCL-7C: REACTIVE BARRIER WALL / LEACHATE USE RESTRICTIONS
 DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
Groundwater Pollution Prevention				(\$25,000)	\$0	\$0	\$0
legal fees	ls	1	\$25,000	\$25,000			
Leachate Control				\$750,000	\$1,510,000		
mobilization	ls	1	\$40,000		\$40,000		
funnel installation	ft ²	40,500	\$4		\$162,000		
gate installation	ft ²	10,500	\$150		\$1,575,000		
iron	ft ³	18,900	\$40	\$756,000			
jacking well materials and installation	well	2	\$20,000		\$40,000		
Monitoring				\$0	\$20,500	\$0	\$0
well installation and materials	well	11	\$4,500		\$49,500		
Site Remediation				\$0	\$0	\$0	\$0
labor	hours	80	\$60			\$4,800	
vehicle	days	4	\$60			\$240	
equipment	ls	1	\$600			\$600	
miscellaneous	ls	1	\$1,000			\$500	
leachate laboratory analysis	each	17	\$130			\$2,210	

⁽¹⁾ The monitoring schedule over 30 years was assumed as:

Years 1,2 = quarterly sampling; Years 3 through 30= semi-annual sampling (Based on RCRA Closure Guidelines)

These costs are incorporated in each alternative's cost summary under "Annual Operation and Maintenance"

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
 AREA 7 - LEACHATE
 ALTERNATIVE SCL-7C: REACTIVE BARRIER WALL / LEACHATE USE RESTRICTIONS
 DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
<i>legal fees</i>	Cost based on CDM experience
<i>mobilization</i>	Cost based on CDM experience
<i>tunnel installation</i>	Cost based on CDM experience
<i>gate installation</i>	Cost based on CDM experience
<i>iron</i>	Cost based on CDM experience
<i>jacking well materials and installation</i>	Cost based on CDM experience
<i>well installation and materials</i>	Cost based on CDM experience in monitoring well installation
<i>labor</i>	Based on 10 hour work day at the average CDM labor rate of \$80 for oversite personnel
<i>vehicle</i>	Based on \$50/day rental fee for a field vehicle
<i>equipment</i>	Based on CDM equipment rental rates
<i>miscellaneous</i>	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
<i>leachate laboratory analysis</i>	Based on average cost incurred for volatile organic compound analysis; One duplicate and one blank will be collected per 10 samples.

TABLE 7-24

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FOCUSED FEASIBILITY STUDY**

**SOURCE AREA 9/10 - LEACHATE
ALTERNATIVE SCL-9/10A: NO ACTION / MONITORING AND NATURAL
ATTENUATION
COST SUMMARY**

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
Leachate Monitoring Wells	\$18,000
SUBTOTAL CONSTRUCTION COSTS	\$43,000
Bid Contingency (15%)	\$6,000
Scope Contingency (20%)	\$9,000
Oversight/Health and Safety (5%)	\$2,000
TOTAL CAPITAL COSTS	\$60,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
Leachate Sampling and Analysis (per event)	\$5,000
TOTAL ANNUAL COSTS	\$5,000
REPLACEMENT COSTS ⁽¹⁾	
Monitoring Well Replacement (every 15 years)	\$29,000
TOTAL REPLACEMENT COSTS	\$29,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽²⁾	\$60,000
Present Worth Annual O&M Costs ⁽²⁾	
Leachate Sampling and Analysis	
Quarterly Sampling - years 1 and 2	\$37,000
Semi-annual Sampling - years 3 through 30	\$106,000
Present Worth Replacement Costs ⁽³⁾	\$14,000
TOTAL PRESENT WORTH	\$217,000

(1) Replacement costs include construction and oversight capital costs.

(2) Capital costs represent the present worth of the given alternative.

(3) Present worth of replacement costs is based on a 7% annual discount rate and replacement of leachate monitoring wells every 15 years (twice over 30 year projection).

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
SOURCE AREA 9/10 - LEACHATE
ALTERNATIVE SCL-9/10A: NO ACTION / MONITORING AND NATURAL ATTENUATION
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
GROUNDWATER MONITORING				\$25,000		\$0	\$0
Legal Fees	ls	1	\$25,000	\$25,000			
WELL INSTALLATION AND MATERIALS					\$18,000		
well installation and materials	well	4	\$4,500		\$18,000		
MONITORING EQUIPMENT						\$2,660	\$0
labor	hours	20	\$60			\$1,200	
vehicle	day	1	\$60			\$60	
equipment	ls	1	\$600			\$600	
miscellaneous	ls	1	\$1,000			\$500	
leachate laboratory analysis	each	7	\$380			\$2,660	

⁽¹⁾ The monitoring schedule over 30 years was assumed as:

Years 1,2 = quarterly sampling; Years 3 through 30= semi-annual sampling (Based on RCRA Closure Guidelines)

These costs are incorporated in each alternative's cost summary under "Annual Operation and Maintenance."

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
 SOURCE AREA 8/10 - LEACHATE
 ALTERNATIVE SCL-8/10A: NO ACTION / MONITORING AND NATURAL ATTENUATION
 DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
GROUNDWATER MONITORING	
<i>legal fees</i>	Cost based on CDM experience
<i>well installation and materials</i>	Cost based on CDM experience in monitoring well installation
<i>labor</i>	Based on 10 hour work day at the average CDM labor rate of \$60 for oversite personnel
<i>vehicle</i>	Based on \$60/day rental fee for a field vehicle
<i>equipment</i>	Based on CDM equipment rental rates
<i>miscellaneous</i>	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
<i>leachate laboratory analysis</i>	Based on average cost incurred for VOCs and bioparameters; One duplicate and one blank will be collected per 10 samples.

TABLE 7-25

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
FOCUSED FEASIBILITY STUDY
ROCKFORD, ILLINOIS**

**AREA 9/10 - LEACHATE
ALTERNATIVE SCL-9/10B: LEACHATE COLLECTION AND TREAT BY AIR STRIPPING
UNIT / DISCHARGE TREATED LEACHATE AT OFF-SITE SURFACE WATER /
LEACHATE USE RESTRICTIONS
COST SUMMARY**

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
Leachate Containment System	\$808,000
Leachate Monitoring Wells	\$23,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$856,000
Bid Contingency (15%)	\$128,000
Scope Contingency (20%)	\$171,000
Engineering and Design (15%)	\$128,000
Oversight/Health and Safety (5%)	\$43,000
TOTAL CAPITAL COSTS	\$1,326,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
Leachate Containment System	\$35,000
Leachate Treatment System Sampling and Analysis (per sampling event)	\$4,000
Leachate Sampling and Analysis (per event)	\$3,000
TOTAL ANNUAL COSTS	\$42,000
REPLACEMENT COSTS ⁽²⁾	
Leachate Containment System (every 15 years)	\$768,000
Monitoring Well Replacement (every 15 years)	\$29,000
TOTAL REPLACEMENT COSTS	\$797,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$1,326,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$434,000
Leachate Treatment System Sampling Quarterly Sampling - years 1 through 30	\$200,000
Leachate Sampling Quarterly Sampling - years 1 and 2	\$22,000
Semi-annual Sampling - years 3 through 30	\$64,000
Present Worth Replacement Costs ⁽⁵⁾	\$394,000
TOTAL PRESENT WORTH	\$2,440,000

(1) Capital costs for construction items do not include oversight fees.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) The "Present Worth Annual O&M Cost" line item includes all annual costs except for costs per sampling and analysis event. Costs incurred for sampling and analysis are broken down per sampling schedule as listed. Sampling and analysis costs are based on a 7% discount rate over a 30 year projection (Based on RCRA Closure Guidelines).

(5) Present worth of replacement costs is based on a 7% annual discount rate and replacement of monitoring wells and leachate containment system (including central pump station, extraction wells, piping, pumps, and air stripping unit) every 15 years (once over 30 year projection).

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
AREA 9/10 - LEACHATE
ALTERNATIVE SCL-9/10B: LEACHATE COLLECTION AND TREAT BY AIR STRIPPING UNIT / DISCHARGE TREATED LEACHATE AT OFF-SITE SURFACE WATER / LEACHATE USE RESTRICTIONS
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
LEGAL FEES							
Legal Fees	ls	1	\$25,000	\$25,000			
MOBILIZATION/DEMOLITION							
mobilization/demobilization for all	ls	1	\$25,000	\$25,000			
treatment building	ls	1	\$40,000	\$40,000			
electrical supply	ls	1	\$1,000	\$1,000			
extraction well installation	well	55	\$5,800		\$319,000		
pump installation	pump	60	\$2,000	\$120,000	\$6,000	\$15,000	
2" dia. carbon steel pipe from well to header pipe	feet	275	\$25	\$6,875			
4" dia. carbon steel header pipe to Central Pump Station	feet	1,150	\$32	\$36,800			
Central Pump Station	ls	1	\$54,500	\$54,500		\$5,000	
4" dia. carbon steel header pipe connected to air stripper unit	feet	50	\$32	\$1,600			
air stripping treatment unit and installation	unit	1	\$40,000	\$40,000	\$5,000	\$15,000	
4" cast iron drainage pipe to off-site surface water discharge	feet	3,800	\$40	\$152,000			
WELL INSTALLATION AND MATERIALS							
well installation and materials	well	5	\$4,500		\$22,500		
LABOR, VEHICLE, EQUIPMENT, AND MISCELLANEOUS							
labor	hours	10	\$60			\$600	
vehicle	day	1	\$60			\$60	
equipment	ls	1	\$600			\$600	
miscellaneous	ls	1	\$1,000			\$500	
leachate treatment system laboratory analysis	each	2	\$1,000			\$2,000	
LEACHATE LABORATORY ANALYSIS							
labor	hours	20	\$60			\$1,200	
vehicle	day	1	\$60			\$60	
equipment	ls	1	\$600			\$600	
miscellaneous	ls	1	\$1,000			\$500	
Leachate laboratory analysis	each	8	\$130			\$1,040	

⁽¹⁾ The monitoring schedule over 30 years was assumed as:

Years 1,2 = quarterly sampling; Years 3 through 30= semi-annual sampling (Based on RCRA Closure Guidelines)

These costs are incorporated in each alternative's cost summary under "Annual Operation and Maintenance."

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
 AREA 9/10 - LEACHATE
 ALTERNATIVE SCL-9/10B: LEACHATE COLLECTION AND TREAT BY AIR STRIPPING UNIT / DISCHARGE TREATED LEACHATE AT OFF-SITE
 SURFACE WATER / LEACHATE USE RESTRICTIONS
 DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
<i>legal fees</i>	Cost based on CDM experience
<i>mobilization/demobilization for all treatment building</i>	Cost based on CDM experience
<i>extraction well installation</i>	Based on a 20 foot x 20 foot building - cost based on Butler Building April 1998 cost estimate
<i>pump installation</i>	4" diameter, stainless steel construction, 35 foot depth with 10 foot screen - cost based on CDM experience of average extraction well installation costs.
<i>2" dia. carbon steel pipe from well to header</i>	2 pumps per well (1 spare) @ 1.2 to 7 gpm flow with control box each pump - costs based on April 1998 Grundfos cost estimate
<i>4" dia. carbon steel header pipe to Central Pump Station</i>	2" diameter carbon steel pipe, 10 foot linkages from each of the 55 wells to treatment unit (with 15% contingency) - cost based on CDM experience
<i>Central Pump Station</i>	4" diameter carbon steel pipe, 10 foot linkages from main line to Central Pumping Station (with 15% contingency) - cost based on CDM experience
<i>4" dia. carbon steel pipe connected to air stripper unit</i>	Includes controls - cost based on CDM experience
<i>air stripping treatment unit and installation</i>	4" diameter carbon steel pipe, 10 foot linkages from Central Pumping Station to treatment unit (with 15% contingency) - cost based on CDM experience
<i>4" cast iron discharge pipe to off-site surface water</i>	Shallow Tray air stripper model 41251 with options - cost based on April 1998 North East Environmental Products, Inc. cost estimate
<i>well installation and materials</i>	4" diameter cast iron pipe, from treatment unit to off-site surface water discharge (with 15% contingency) - cost based on CDM experience
<i>labor</i>	Cost based on CDM experience in monitoring well installation
<i>vehicle</i>	Based on 10 hour work day at the average CDM labor rate of \$60 for oversite personnel
<i>equipment</i>	Based on \$60/day rental fee for a field vehicle
<i>miscellaneous</i>	Based on CDM equipment rental rates
<i>leachate treatment system laboratory analysis</i>	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
	Based on average cost incurred for priority pollutants analysis; One duplicate and one blank will be collected per 10 samples.
<i>labor</i>	Based on 10 hour work day at the average CDM labor rate of \$60 for oversite personnel
<i>vehicle</i>	Based on \$300/week rental fee for a field vehicle
<i>equipment</i>	Based on CDM equipment rental rates
<i>miscellaneous</i>	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
<i>leachate laboratory analysis</i>	Based on average cost incurred for VOC analysis; One duplicate and one blank will be collected per 10 samples.

TABLE 7-26
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FOCUSED FEASIBILITY STUDY

SOURCE AREA 9/10
ALTERNATIVE SCL-9/10C: AIR SPARGING (AS) ALONG GMZ BOUNDARY / MONITORING /
GROUNDWATER USE RESTRICTIONS
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
General	\$1,038,000
Leachate Monitoring Wells	\$23,000
VRS	\$232,000
Air Sparging	\$161,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$1,479,000
Bid Contingency (15%)	\$222,000
Scope Contingency (20%)	\$296,000
Engineering and Design (15%)	\$222,000
Oversight/Health and Safety (5%)	\$74,000
TOTAL CAPITAL COSTS	\$2,293,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
Leachate Sampling and Analysis (per event)	\$3,000
VRS Regular Maintenance/Electrical	\$26,000
Regular System Maintenance/Electrical	\$36,000
TOTAL ANNUAL COSTS	\$65,000
REPLACEMENT COSTS	
Monitoring Wells (every 15 years)	\$29,000
Equipment Replacement (e.g., motors, blowers) - every 15 years	\$15,000
TOTAL REPLACEMENT COSTS ⁽²⁾	\$44,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$2,293,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$807,000
Leachate Sampling	
Quarterly Sampling - years 1 and 2	\$22,000
Semi-annual Sampling - years 3 through 30	\$64,000
Present Worth Replacement Costs ⁽⁵⁾	\$22,000
TOTAL PRESENT WORTH	\$3,208,000

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.

(5) Present worth of replacement costs is based on a 7% annual discount rate and replacement of system equipment and leachate monitoring wells every 15 years (once over 30 year projection).

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 9/10

**ALTERNATIVE SCL-9/10C: AIR SPARGING (AS) ALONG GMZ BOUNDARY / MONITORING / GROUNDWATER USE RESTRICTIONS
DETAILED COST ESTIMATE**

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
Construction/Installation Costs				\$25,000	\$0	\$0	\$0
Legal Fees	ls	1	\$25,000	\$25,000			
Construction/Installation Costs				\$99,000			
construction trailer (rental and delivery)	mo	360	\$275	\$99,000			
mobilization	ls	1	\$1,000	\$1,000			
demobilization	ls	1	\$1,000	\$1,000			
decon facilities	ea	1	\$1,000	\$1,000			
health and safety equipment	mo	360	\$2,000	\$720,000			
electrical power service supply	mo	360	\$400	\$144,000			
water supply	mo	360	\$200	\$72,000			
well installation and materials	well	5	\$4,500		\$22,500		
VRS well installation	ea.	6	\$6,000		\$36,000		
VRS main system	ls	1	\$14,000	\$14,000	\$5,000	\$10,000	
VRS control panels	ls	1	\$3,000	\$3,000	\$1,000	\$500	
6" carbon steel piping	ft	800	\$57	\$45,600			
4" carbon steel piping	ft	50	\$32	\$1,600			
excavation for piping placement	ft	850	\$0.67		\$570		
electrical power requirements (10 HP)	yr.	1	\$10,000			\$10,000	
SVE treatment building	sf	400	\$100	\$40,000	included		
air/water separator tank	ls	1	\$5,000	\$5,000		\$1,000	
carbon adsorption of emission	ls	1	\$80,000	\$80,000	included	\$4,000	
Leachate Laboratory Analysis						\$1,200	
labor	hours	20	\$60			\$1,200	
vehicle	day	1	\$60			\$60	
equipment	ls	1	\$600			\$600	
miscellaneous	ls	1	\$1,000			\$500	
Leachate laboratory analysis	each	8	\$130			\$1,040	
AS well installation	ea.	10	\$6,000		\$60,000		
AS main system	ls	1	\$18,000	\$18,000	\$8,000	\$10,000	
AS control panels	ls	1	\$3,000	\$3,000	\$1,500	\$500	
6" carbon steel piping	ft	1150	\$57	\$65,550			
4" carbon steel piping	ft	200	\$32	\$6,400			
excavation for piping placement	ft	1350	\$0.67		\$905		
electrical power requirements (25 HP)	year	1	\$25,000			\$25,000	
AS treatment building	Costs for AS treatment building included with corresponding VRS						
air/water separator tank	Costs for air/water separator tank included with corresponding VRS						
activated carbon treatment	Costs for activated carbon air treatment included with corresponding VRS						

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 9/10

**ALTERNATIVE SCL-9/10C: AIR SPARGING (AS) ALONG GMZ BOUNDARY / MONITORING / GROUNDWATER USE RESTRICTIONS
DETAILED COST ESTIMATE - COMMENTS**

COST COMPONENT	COMMENTS
Groundwater Use Restrictions	
<i>legal fees</i>	Cost based on CDM experience
Construction	
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
Monitoring	
well installation and materials	Cost based on CDM experience in monitoring well installation
VRS well installation	Cost associated with installation of SVE wells. Based on CDM experience.
	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mntng, interconnecting piping and a manual motor start switch
VRS main system	Vendor estimate - NEEP (May 1998)
VRS control panels	based on CDM experience
6" carbon steel pipe	based on CDM experience
4" carbon steel pipe	based on CDM experience
excavation for piping placement (5 foot depth)	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power requirements (10 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
VRS treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
air/water separator tank	Based on CDM experience
activated carbon	Based on CDM experience
AS well installation	Cost associated with installation of AS wells. Based on CDM experience.
	Vendor: includes blower, exp motor, inline silencer, pressure relief valve, unitized base, pressure gauge and a manual motor starting switch.
AS main system	Vendor estimate
AS control panels	Based on CDM experience
6" carbon steel piping	Based on CDM experience
4" carbon steel piping	Based on CDM experience
excavation for piping placement	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power requirements (25 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
AS treatment building	Costs for AS treatment building included with corresponding VRS
air/water separator tank	Costs for air/water separator tank included with corresponding VRS
activated carbon treatment	Costs for activated carbon air treatment included with corresponding VRS

TABLE 7-27

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
FOCUSED FEASIBILITY STUDY
ROCKFORD, ILLINOIS**

**AREA 9/10 - LEACHATE
ALTERNATIVE SCL-9/10D: REACTIVE BARRIER WALL / LEACHATE MONITORING/
GROUNDWATER USE RESTRICTIONS
COST SUMMARY**

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
Reactive Barrier Wall	\$2,073,000
Leachate Monitoring Wells	\$50,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$2,148,000
Bid Contingency (15%)	\$322,000
Scope Contingency (20%)	\$430,000
Engineering and Design (15%)	\$322,000
Oversight/Health and Safety (5%)	\$107,000
TOTAL CAPITAL COSTS	\$3,329,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
Leachate Sampling and Analysis (per event)	\$5,000
TOTAL ANNUAL COSTS	\$5,000
REPLACEMENT COSTS ⁽¹⁾	
Iron Replacement (every 10 years)	\$25,000
Monitoring Well Replacement (every 15 years)	\$58,000
TOTAL REPLACEMENT COSTS	\$83,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$3,329,000
Present Worth Annual O&M Costs ⁽²⁾	
Quarterly Sampling - years 1 and 2	\$37,000
Semi-annual Sampling - years 3 through 30	\$106,000
Present Worth Replacement Costs ⁽³⁾	\$51,000
TOTAL PRESENT WORTH	\$3,523,000

(1) Replacement costs include construction and oversight capital costs.

(2) Capital costs represent the present worth of the given alternative.

(3) Present worth of replacement costs is based on a 7% annual discount rate and replacement of monitoring wells every 15 years (once over 30 year projection) and iron replacement every 10 years (twice over 30 year projection).

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
AREA 9/10 - LEACHATE**

**ALTERNATIVE SCL-9/10D: REACTIVE BARRIER WALL / LEACHATE MONITORING/ GROUNDWATER USE RESTRICTIONS
DETAILED COST ESTIMATE**

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
Construction/Installation							
legal fees	ls	1	\$25,000	\$25,000			
Operation and Maintenance							
mobilization	ls	1	\$40,000		\$40,000		
tunnel installation	ft ²	43,250	\$4		\$173,000		
gate installation	ft ²	10,000	\$150		\$1,500,000		
iron	ft ³	8,000	\$40	\$320,000			
jetting well materials and installation	well	2	\$20,000		\$40,000		
Monitoring							
well installation and materials	well	11	\$4,500		\$49,500		
Leachate Laboratory Analysis							
labor	hours	40	\$60			\$2,400	
vehicle	days	2	\$60			\$120	
equipment	ls	1	\$600			\$600	
miscellaneous	ls	1	\$1,000			\$500	
leachate laboratory analysis	each	14	\$130			\$1,820	

⁽¹⁾ The monitoring schedule over 30 years was assumed as:

Years 1,2 = quarterly sampling; Years 3 through 30= semi-annual sampling (Based on RCRA Closure Guidelines)

These costs are incorporated in each alternative's cost summary under "Annual Operation and Maintenance"

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
 AREA 9/10 - LEACHATE
 ALTERNATIVE SCL-9/10D: REACTIVE BARRIER WALL / LEACHATE MONITORING/ GROUNDWATER USE RESTRICTIONS
 DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
legal fees	Cost based on CDM experience
mobilization	Cost Based on CDM experience
funnel installation	Cost Based on CDM experience
gate installation	Cost Based on CDM experience
iron	Cost Based on CDM experience
jacking well materials and installation	Cost based on CDM experience
well installation and materials	Cost based on CDM experience in monitoring well installation
labor	Based on 10 hour work day at the average CDM labor rate of \$60 for oversite personnel
vehicle	Based on \$60/day rental fee for a field vehicle
equipment	Based on CDM equipment rental rates
miscellaneous	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
leachate laboratory analysis	Based on average cost incurred for volatile organic compound analysis; One duplicate and one blank will be collected per 10 samples.

TABLE 7-28
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FOCUSED FEASIBILITY STUDY

SOURCE AREA 9/10
ALTERNATIVE SCL-9/10E: AIR SPARGING (AS) ALONG GMZ BOUNDARY AND SOURCE AREA /
MONITORING / GROUNDWATER USE RESTRICTIONS
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
General	\$1,038,000
Leachate Monitoring Wells	\$23,000
VRS	\$423,000
Air Sparging	\$231,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$1,740,000
Bid Contingency (15%)	\$261,000
Scope Contingency (20%)	\$348,000
Engineering and Design (15%)	\$261,000
Oversight/Health and Safety (5%)	\$87,000
TOTAL CAPITAL COSTS	\$2,697,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
VRS Regular Maintenance/Electrical	\$26,000
Leachate Sampling and Analysis (per event)	\$3,000
Regular System Maintenance/Electrical	\$36,000
TOTAL ANNUAL COSTS	\$65,000
REPLACEMENT COSTS	
Leachate Monitoring Wells (every 15 years)	\$29,000
Equipment Replacement (e.g., motors, blowers) - every 15 years	\$30,000
TOTAL REPLACEMENT COSTS ⁽²⁾	\$59,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$2,697,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$807,000
Leachate Sampling	
Quarterly Sampling - years 1 and 2	\$22,000
Semi-annual Sampling - years 3 through 30	\$64,000
Present Worth Replacement Costs ⁽⁵⁾	\$29,000
TOTAL PRESENT WORTH	\$3,619,000

- (1) Capital costs for construction items do not include oversight fees, which are accounted for separately.
- (2) Replacement costs include construction and oversight capital costs.
- (3) Capital costs represent the present worth of the given alternative.
- (4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.
- (5) Present worth of replacement costs is based on a 7% annual discount rate and replacement of system equipment every 15 years (once over 30 year projection).

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 9/10
ALTERNATIVE SCL-9/10E: AIR SPARGING (AS) ALONG GMZ BOUNDARY AND SOURCE AREA / MONITORING / GROUNDWATER USE
RESTRICTIONS
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
Groundwater Use Restrictions				\$25,000			
legal fees	ls	1	\$25,000	\$25,000			
Construction							
construction trailer (rental and delivery)	mo	360	\$275	\$99,000			
mobilization	ls	1	\$1,000	\$1,000			
demobilization	ls	1	\$1,000	\$1,000			
decon facilities	ea	1	\$1,000	\$1,000			
health and safety equipment	mo	360	\$2,000	\$720,000			
electrical power service supply	mo	360	\$400	\$144,000			
water supply	mo	360	\$200	\$72,000			
Well Installation and Materials					\$22,500		
Operation and Maintenance							
labor	hours	20	\$60			\$1,200	
vehicle	day	1	\$60			\$60	
equipment	ls	1	\$600			\$600	
miscellaneous	ls	1	\$1,000			\$500	
Leechate laboratory analysis	each	7	\$130			\$910	
Vapor Intrusion Mitigation							
VRS well installation	ea.	10	\$6,000		\$60,000		
VRS main system	ls	2	\$14,000	\$14,000	\$5,000	\$10,000	
VRS control panels	ls	2	\$3,000	\$3,000	\$1,000	\$500	
6" carbon steel piping	ft	1530	\$57	\$87,210			
4" carbon steel piping	ft	50	\$32	\$1,600			
excavation for piping placement	ft	1580	\$0.67		\$1,059		
electrical power requirements (10 HP)	yr.	1	\$20,000			\$10,000	
VRS treatment building (two buildings)	sf	800	\$100	\$80,000	included		
air/water separator tank	ls	2	\$5,000	\$10,000		\$1,000	
carbon adsorption of emission	ls	2	\$80,000	\$160,000	included	\$4,000	
Air Sparging (AS) System							
AS well installation	ea	15	\$6,000		\$90,000		
AS main system	ls	1	\$18,000	\$18,000	\$6,000	\$10,000	
AS control panels	ls	1	\$3,000	\$3,000	\$1,500	\$500	
6" carbon steel piping	ft	1750	\$57	\$99,750			
4" carbon steel piping	ft	350	\$32	\$11,200			
excavation for piping placement	ft	2100	\$0.67		\$1,407		
electrical power requirements (25 HP)	year	1	\$25,000			\$25,000	
AS treatment building	Costs for AS treatment building included with corresponding VRS						
air/water separator tank	Costs for air/water separator tank included with corresponding VRS						
activated carbon treatment	Costs for carbon air treatment included with corresponding VRS						

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 9/10
ALTERNATIVE SCL-9/10E: AIR SPARGING (AS) ALONG GMZ BOUNDARY AND SOURCE AREA / MONITORING / GROUNDWATER USE
RESTRICTIONS
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
GROUNDWATER MONITORING	
legal fees	Cost based on CDM experience
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
well installation and materials	Cost based on CDM experience in monitoring well installation
labor	Based on 10 hour work day at the average CDM labor rate of \$60 for oversite personnel
vehicle	Based on \$300/week rental fee for a field vehicle
equipment	Based on CDM equipment rental rates
miscellaneous	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
leachate laboratory analysis	Based on average cost incurred for VOC analysis; One duplicate and one blank will be collected per 10 samples.
GROUNDWATER TREATMENT	
VRS well installation	Cost associated with installation of SVE wells. Based on CDM experience.
VRS main system	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mnting, interconnecting piping and a manual motor start switch
VRS control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel pipe	based on CDM experience
4" carbon steel pipe	based on CDM experience
excavation for piping placement (5 foot depth)	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power requirements (10 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
VRS treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
air/water separator tank	Based on CDM experience
activated carbon	Based on CDM experience
AIR SPARGING	
AS well installation	Cost associated with installation of AS wells. Based on CDM experience.
AS main system	Vendor: includes blower, exp motor, inline silencer, pressure relief valve, unitized base, pressure gauge and a manual motor starting switch.
AS control panels	Vendor estimate
6" carbon steel piping	Based on CDM experience
4" carbon steel piping	Based on CDM experience
excavation for piping placement	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power requirements (25 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
AS treatment building	Costs for AS treatment building included with corresponding VRS
air/water separator tank	Costs for air/water separator tank included with corresponding VRS
activated carbon treatment	Costs for carbon air treatment included with corresponding VRS

TABLE 7-29

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FOCUSED FEASIBILITY STUDY**

**SOURCE AREA 11 - LEACHATE
ALTERNATIVE SCL-11A: NO ACTION / LEACHATE MONITORING/ NATURAL
ATTENUATION/ GROUNDWATER USE RESTRICTIONS
COST SUMMARY**

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
Leachate Monitoring Wells	\$18,000
SUBTOTAL CONSTRUCTION COSTS	\$43,000
Bid and Scope Contingency (20%)	\$9,000
Oversight/Health and Safety (5%)	\$2,000
TOTAL CAPITAL COSTS ⁽¹⁾	\$54,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
Leachate Sampling and Analysis (per event)	\$8,000
TOTAL ANNUAL COSTS	\$8,000
REPLACEMENT COSTS ⁽²⁾	
Monitoring Well Replacement (every 15 years)	\$29,000
TOTAL REPLACEMENT COSTS	\$29,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$54,000
Present Worth Annual O&M Costs ⁽⁴⁾	
Leachate Sampling	
Quarterly Sampling - years 1 and 2	\$59,000
Semi-annual Sampling - years 3 through 30	\$170,000
Present Worth Replacement Costs ⁽⁵⁾	\$14,000
TOTAL PRESENT WORTH	\$297,000

(1) Capital costs for construction items do not include oversight fees.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) The "Present Worth Annual O&M Cost" line item includes all annual costs except for costs per sampling and analysis event. Costs incurred for sampling and analysis are broken down per sampling schedule as listed. Sampling and analysis costs are based on a 7% discount rate over a 30 year projection (Based on RCRA Closure Guidelines).

(5) Present worth of replacement costs is based on a 7% annual discount rate and replacement of monitoring wells replacement every 15 years.

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
SOURCE AREA 11 - LEACHATE**

**ALTERNATIVE SCL-11A: NO ACTION / LEACHATE MONITORING/ NATURAL ATTENUATION/ GROUNDWATER USE RESTRICTIONS
DETAILED COST ESTIMATE**

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
Legal Fees	ls	1	\$25,000	\$25,000			
well installation and materials	well	4	\$4,500		\$18,000		
labor	hours	60	\$60			\$3,600	
vehicle	day	3	\$60			\$180	
equipment	ls	1	\$1,000			\$600	
miscellaneous	ls	1	\$1,500			\$500	
leachate laboratory analysis	each	8	\$380			\$3,040	

⁽¹⁾ The monitoring schedule over 30 years was assumed as:

Years 1,2 = quarterly sampling; Years 3 through 30= semi-annual sampling (Based on RCRA Closure Guidelines)

These costs are incorporated in each alternative's cost summary under "Annual Operation and Maintenance"

**SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
SOURCE AREA 11 - LEACHATE**

**ALTERNATIVE SCL-11A: NO ACTION / LEACHATE MONITORING/ NATURAL ATTENUATION/ GROUNDWATER USE RESTRICTIONS
DETAILED COST ESTIMATE - COMMENTS**

COST COMPONENT	COMMENTS
<i>legal fees</i>	Cost based on CDM experience
<i>well installation and materials</i>	Cost based on CDM experience in monitoring well installation
<i>labor</i>	Based on 10 hour work day at the average CDM labor rate of \$60 for oversite personnel
<i>vehicle</i>	Based on \$80/day rental fee for a field vehicle
<i>equipment</i>	Based on CDM equipment rental rates
<i>miscellaneous</i>	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
<i>leachate laboratory analysis</i>	Based on average cost incurred for VOCs and bioparameters; One duplicate and one blank will be collected per 10 samples.

APPENDIX D.1

DETAILED COST BACKUP

CATALYTIC OXIDATION VS. GRANULAR ACTIVATED CARBON

ALTERNATIVE SCS-4C

TABLE 7-3
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 4
ALTERNATIVE SCS-4C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
General	\$3,000
Soil Vapor Extraction (with emission controls)	\$206,000
Catalytic Oxidation System	\$134,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$343,000
Bid Contingency (10%)	\$34,000
Scope Contingency (10%)	\$34,000
Engineering and Design (15%)	\$51,000
Oversight/Health and Safety (5%)	\$17,000
TOTAL CAPITAL COSTS	\$479,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$18,000
Regular System Maintenance/Electrical	\$22,000
Catalytic Oxidation System Maintenance	\$63,160
Post Treatment Sampling	\$32,000
TOTAL ANNUAL COSTS	\$135,160
REPLACEMENT COSTS	
None	\$0
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$479,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$1,677,000
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$2,156,000

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4
ALTERNATIVE SCS-4C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Construction/			Start-up & Baseline Costs
				Capital Cost	Installation Costs	Annual O&M Costs	
Construction				\$3,000	\$0	\$18,300	\$0
construction trailer (rental and delivery)	yr	1	\$3,300			\$3,300	
mobilization	ls	1	\$1,000	\$1,000			
demobilization	ls	1	\$1,000	\$1,000			
decon facilities	ea.	1	\$1,000	\$1,000			
health and safety equipment	yr	1	\$9,000			\$9,000	
electrical power service supply	yr	1	\$3,600			\$3,600	
water supply	yr	1	\$2,400			\$2,400	
Process Equipment				\$144,000	\$214	\$10,000	\$0
SVE well installation	ea.	3	\$6,000		\$18,000		
SVE main system	ls	1	\$14,000	\$14,000	\$5,000	\$10,000	
SVE control panels	ls	1	\$3,000	\$3,000	\$1,000	\$500	
6" carbon steel piping	ft	210	\$57	\$11,970			
4" carbon steel piping	ft	110	\$32	\$3,520			
excavation for piping placement	ft	320	\$0.67		\$214		
electrical power requirements (10 HP)	yr.	1	\$10,000			\$10,000	
SVE treatment building	sf	800	\$180	\$144,000	included		
air/water separator tank	ls	1	\$5,000	\$5,000		\$1,000	
Post Treatment				\$5,500	\$0	\$44,000	\$0
Catalytic Oxidation Unit	ls	1	\$134,000	\$134,000	included	\$10,000	
Natural Gas	ls	1	\$7,000			\$7,000	
Catalyst Replacement	ea.	9	\$7,200			\$2,160	
Sampling	ea.	8	\$5,500			\$44,000	
Operation & Maintenance				\$0	\$0	\$26,200	\$0
Test Kits/ Field Screening (per year)	samples	11	\$300			\$3,300	
Laboratory Analysis (VOCs, N, P) (per year)	samples	131	\$200			\$26,200	
shipping and handling (per year)	shipmt	24	\$100			\$2,400	

(1) All Post Treatment Sampling costs are presented in costs per number of samples and shipments required per year - costs are presented as annual O&M costs

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4
ALTERNATIVE SCS-4C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
Construction	
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
Soil Vapor Extraction System	
SVE well installation	Cost associated with installation of SVE wells. Based on CDM experience.
SVE main system	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mnting, interconnecting piping and a manual motor start switch
SVE control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel pipe	Based on CDM experience
4" carbon steel pipe	Based on CDM experience
excavation for piping placement (5 foot depth)	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
electrical power requirements (10 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
SVE treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
Catalytic Oxidation System	
Catalytic Oxidation Unit	Vendor estimate - Global Technologies, Inc (May 2000)
Natural Gas	Vendor estimate - Global Technologies, Inc (May 2000)
Catalyst Replacement	Vendor estimate - Global Technologies, Inc (May 2000)
Sampling	Based on CDM experience
Soil Vapor Monitoring System	
Test Kits/ Field Screening (per year)	Based on CDM experience and average test kit costs - ~25 samples per test kit; samples collected on a grid of 1 sample/250 cy contam. mat'l; 1 sampling grid per 2 weeks
Laboratory Analysis (VOCs, N, P) (per year)	Based on 1998 sample analysis costs from Midwest laboratories; samples collected on a grid of 1 sample/250cy contam. material; 1 sampling grid per month (including QA/QC samples)
shipping and handling (per year)	Costs associated with transporting samples from site to laboratory twice per month

TABLE 7-3
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 4
ALTERNATIVE SCS-4C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION (YEAR 0 - 6
MONTHS) / GRANULAR ACTIVATED CARBON (6 MONTHS - YEAR 30)
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
General	\$3,000
Soil Vapor Extraction (with emission controls)	\$206,000
Catalytic Oxidation System	\$134,000
Granular Activated Carbon	\$24,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$367,000
Bid Contingency (10%)	\$37,000
Scope Contingency (10%)	\$37,000
Engineering and Design (15%)	\$55,000
Oversight/Health and Safety (5%)	\$18,000
TOTAL CAPITAL COSTS	\$514,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$18,000
Regular System Maintenance/Electrical	\$22,000
Catalytic Oxidation System Maintenance	\$58,000
Granular Activated Carbon Maintenance	\$120,600
Post Treatment Sampling	\$32,000
TOTAL ANNUAL COSTS	\$250,600
REPLACEMENT COSTS	
None	\$0
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$514,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$2,359,000
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$2,873,000

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4
ALTERNATIVE SCS-4C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION (YEAR 0 - 6 MONTHS) / GRANULAR ACTIVATED CARBON (6 MONTHS - YEAR 30)
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
CONSTRUCTION				\$3,300	\$0	\$18,300	\$0
construction trailer (rental and delivery)	yr	1	\$3,300			\$3,300	
mobilization	ls	1	\$1,000	\$1,000			
demobilization	ls	1	\$1,000	\$1,000			
decon facilities	ea	1	\$1,000	\$1,000			
health and safety equipment	yr	1	\$9,000			\$9,000	
electrical power service supply	yr	1	\$3,600			\$3,600	
water supply	yr	1	\$2,400			\$2,400	
POST TREATMENT SAMPLING				\$15,180	\$2,500	\$15,500	\$0
SVE well installation	ea	3	\$6,000		\$18,000		
SVE main system	ls	1	\$14,000	\$14,000	\$5,000	\$10,000	
SVE control panels	ls	1	\$3,000	\$3,000	\$1,000	\$500	
6" carbon steel piping	ft	210	\$57	\$11,970			
4" carbon steel piping	ft	110	\$32	\$3,520			
excavation for piping placement	ft	320	\$0.67		\$214		
electrical power requirements (10 HP)	yr	1	\$10,000			\$10,000	
SVE treatment building	sf	800	\$180	\$144,000	included		
air/water separator tank	ls	1	\$5,000	\$5,000		\$1,000	
CATALYTIC OXIDATION				\$134,000	included	\$10,000	\$0
Catalytic Oxidation Unit	ls	1	\$134,000	\$134,000	included	\$10,000	
Natural Gas	ls	1	\$4,000			\$4,000	
Sampling	ea	8	\$5,500			\$44,000	
GRANULAR ACTIVATED CARBON				\$24,000	included	\$108,000	\$0
Vapor Phase Carbon	ea	2	\$12,000	\$24,000			
Regeneration	ea	9.00	\$12,000			\$108,000	
Disposal	lb	3600	\$3			\$9,000	
Sampling	ea	9.00	\$400			\$3,600	
TESTING						\$3,300	\$0
Test Kits/ Field Screening (per year)	samples	11	\$300			\$3,300	
Laboratory Analysis (VOCs, N, P) (per year)	samples	131	\$200			\$26,200	
shipping and handling (per year)	shipmt	24	\$100			\$2,400	

(1) All Post Treatment Sampling costs are presented in costs per number of samples and shipments required per year - costs are presented as annual O&M costs

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4
ALTERNATIVE SCS-4C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION (YEAR 0 - 6 MONTHS) / GRANULAR ACTIVATED CARBON
(6 MONTHS - YEAR 30)

DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
SVE well installation	Cost associated with installation of SVE wells. Based on CDM experience.
SVE main system	Vendor: includes blower, exp motor, inline air filter, silencers, diaphragm valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mntng, interconnecting piping and a manual motor start switch
SVE control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel pipe	Based on CDM experience
4" carbon steel pipe	Based on CDM experience
excavation for piping placement (5 foot depth)	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
electrical power requirements (10 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
SVE treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
air/water separator tank	Based on CDM experience
catalytic oxidizer/thermal treatment	Based on vendor estimates
Catalytic Oxidation Unit	Vendor estimate - Global Technologies, Inc. (May 2000)
Natural Gas	Vendor estimate - Global Technologies, Inc. (May 2000)
Sampling	Based on CDM experience
Vapor Phase Carbon	Vendor estimate - Carbtrol (May 2000)
Regeneration	Vendor estimate - Carbtrol (May 2000)
Disposal	Vendor estimate - Carbtrol (May 2000)
Sampling	Vendor estimate - Carbtrol (May 2000)
Test Kits/ Field Screening (per year)	Based on CDM experience and average test kit costs - ~25 samples per test kit; samples collected on a grid of 1 sample/250 cy contam. mat'l; 1 sampling grid per 2 weeks
Laboratory Analysis (VOCs, N, P) (per year)	Based on 1998 sample analysis costs from Midwest laboratories; samples collected on a grid of 1 sample/250cy contam. material; 1 sampling grid per month (including QA/QC samples)
shipping and handling (per year)	Costs associated with transporting samples from site to laboratory twice per month

TABLE 7-3
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 4
ALTERNATIVE SCS-4C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION (YEAR 0 -
YEAR 1) / GRANULAR ACTIVATED CARBON (YEAR 1- YEAR 30)
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
General	\$3,000
Soil Vapor Extraction (with emission controls)	\$206,000
Catalytic Oxidation System	\$134,000
Granular Activated Carbon	\$24,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$367,000
Bid Contingency (10%)	\$37,000
Scope Contingency (10%)	\$37,000
Engineering and Design (15%)	\$55,000
Oversight/Health and Safety (5%)	\$18,000
TOTAL CAPITAL COSTS	\$514,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$18,000
Regular System Maintenance/Electrical	\$22,000
Catalytic Oxidation System Maintenance	\$61,000
Granular Activated Carbon Maintenance	\$120,600
Post Treatment Sampling	\$32,000
TOTAL ANNUAL COSTS	\$253,600
REPLACEMENT COSTS	
None	\$0
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$514,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$2,334,000
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$2,848,000

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4
ALTERNATIVE SCS-4C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION (YEAR 0 - YEAR 1) / GRANULAR ACTIVATED CARBON
(YEAR 1- YEAR 30)
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
construction trailer (rental and delivery)	yr	1	\$3,300	\$3,300		\$3,300	
mobilization	ls	1	\$1,000	\$1,000			
demobilization	ls	1	\$1,000	\$1,000			
decon facilities	ea	1	\$1,000	\$1,000			
health and safety equipment	yr	1	\$9,000			\$9,000	
electrical power service supply	yr	1	\$3,600			\$3,600	
water supply	yr	1	\$2,400			\$2,400	
SVE well installation	ea	3	\$6,000	\$18,000	\$18,000		
SVE main system	ls	1	\$14,000	\$14,000	\$5,000	\$10,000	
SVE control panels	ls	1	\$3,000	\$3,000	\$1,000	\$500	
6" carbon steel piping	ft	210	\$57	\$11,970			
4" carbon steel piping	ft	110	\$32	\$3,520			
excavation for piping placement	ft	320	\$0.67		\$214		
electrical power requirements (10 HP)	yr.	1	\$10,000			\$10,000	
SVE treatment building	sf	600	\$180	\$144,000	included		
air/water separator tank	ls	1	\$5,000	\$5,000		\$1,000	
Catalytic Oxidation Unit	ls	1	\$134,000	\$134,000	included	\$10,000	
Natural Gas	ls	1	\$7,000			\$7,000	
Sampling	ea	8	\$5,500			\$44,000	
Vapor Phase Carbon	ea	2	\$12,000	\$24,000			
Regeneration	lb	9.00	\$12,000			\$108,000	
Disposal	lb	3600	\$3			\$9,000	
Sampling	ea	9.00	\$400			\$3,600	
Test Kits/ Field Screening (per year)	samples	11	\$300			\$3,300	
Laboratory Analysis (VOCs, N, P) (per year)	samples	131	\$200			\$26,200	
shipping and handling (per year)	shipmt	24	\$100			\$2,400	

(1) All Post Treatment Sampling costs are presented in costs per number of samples and shipments required per year - costs are presented as annual O&M costs

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4
ALTERNATIVE SCS-4C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION (YEAR 0 - YEAR 1) / GRANULAR ACTIVATED CARBON
(YEAR 1- YEAR 30)
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
General	
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
Soil Vapor Extraction (SVE)	
SVE well installation	Cost associated with installation of SVE wells. Based on CDM experience.
	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mnting.
SVE main system	interconnecting piping and a manual motor start switch
SVE control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel pipe	based on CDM experience
4" carbon steel pipe	based on CDM experience
excavation for piping placement (5 foot depth)	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
electrical power requirements (10 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
SVE treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
air/water separator tank	Based on CDM experience
Catalytic Oxidation Unit	Vendor estimate - Global Technologies, Inc (May 2000)
Natural Gas	Vendor estimate - Global Technologies, Inc (May 2000)
Sampling	Based on CDM experience
Granular Activated Carbon (GAC)	
Vapor Phase Carbon	Vendor estimate - Carbtrol (May 2000)
Regeneration	Vendor estimate - Carbtrol (May 2000)
Disposal	Vendor estimate - Carbtrol (May 2000)
Sampling	Vendor estimate - Carbtrol (May 2000)
Test Kits/ Field Screening (per year)	Based on CDM experience and average test kit costs - ~25 samples per test kit; samples collected on a grid of 1 sample/250 cy contam. mat'l; 1 sampling grid per 2 weeks
Laboratory Analysis (VOCs, N, P) (per year)	Based on 1998 sample analysis costs from Midwest laboratories; samples collected on a grid of 1 sample/250cy contam. material; 1 sampling grid per month (including QA/QC samples)
shipping and handling (per year)	Costs associated with transporting samples from site to laboratory twice per month

TABLE 7-3
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 4
ALTERNATIVE SCS-4C: SOIL VAPOR EXTRACTION (SVE) / GRANULAR ACTIVATED CARBON
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
General	\$3,000
Soil Vapor Extraction (with emission controls)	\$206,000
Granular Activated Carbon	\$24,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$233,000
Bid Contingency (10%)	\$23,000
Scope Contingency (10%)	\$23,000
Engineering and Design (15%)	\$35,000
Oversight/Health and Safety (5%)	\$12,000
TOTAL CAPITAL COSTS	\$326,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$15,000
Regular System Maintenance/Electrical	\$22,000
Granular Activated Carbon Maintenance (Year 0- Year 1)	\$3,516,800
Granular Activated Carbon Maintenance (Year 1- Year 30)	\$120,600
Post Treatment Sampling	\$32,000
TOTAL ANNUAL COSTS	\$3,706,400
REPLACEMENT COSTS	
None	\$0
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$326,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$5,527,000
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$5,853,000

- (1) Capital costs for construction items do not include oversight fees, which are accounted for separately.
(2) Replacement costs include construction and oversight capital costs.
(3) Capital costs represent the present worth of the given alternative.
(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4
ALTERNATIVE SCS-4C: SOIL VAPOR EXTRACTION (SVE) / GRANULAR ACTIVATED CARBON
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
CONSTRUCTION				\$3,300		\$15,000	
construction trailer (rental and delivery)	yr	1	\$3,300				
mobilization	ls	1	\$1,000	\$1,000			
demobilization	ls	1	\$1,000	\$1,000			
decon facilities	ea	1	\$1,000	\$1,000			
health and safety equipment	yr	1	\$9,000			\$9,000	
electrical power service supply	yr	1	\$3,600			\$3,600	
water supply	yr	1	\$2,400			\$2,400	
SOIL VAPOR EXTRACTION (SVE)				\$118,000	\$24,214	\$27,500	
SVE well installation	ea	3	\$6,000		\$18,000		
SVE main system	ls	1	\$14,000	\$14,000	\$5,000	\$10,000	
SVE control panels	ls	1	\$3,000	\$3,000	\$1,000	\$500	
6" carbon steel piping	ft	210	\$57	\$11,970			
4" carbon steel piping	ft	110	\$32	\$3,520			
excavation for piping placement	ft	320	\$0.67		\$214		
electrical power requirements (10 HP)	yr.	1	\$10,000			\$10,000	
SVE treatment building	sf	800	\$180	\$144,000	included		
air/water separator tank	ls	1	\$5,000	\$5,000		\$1,000	
POST TREATMENT SAMPLING				\$2,400		\$3,300	
Vapor Phase Carbon	ea	2	\$12,000	\$24,000			
First Year Vapor Phase Carbon Regeneration	ea	157.00	\$12,000			\$1,884,000	
First Year Vapor Phase Carbon Disposal	lb	628000	\$3			\$1,570,000	
First Year Vapor Phase Carbon Sampling	ea	157.00	\$400			\$62,800	
POST TREATMENT SAMPLING (continued)						\$108,000	
Regeneration	ea	9.00	\$12,000			\$108,000	
Disposal	lb	3600	\$3			\$9,000	
Sampling	ea	9.00	\$400			\$3,600	
TESTING							
Test Kits/ Field Screening (per year)	samples	11	\$300			\$3,300	
Laboratory Analysis (VOCs, N, P) (per year)	samples	131	\$200			\$26,200	
shipping and handling (per year)	shipmt	24	\$100			\$2,400	

(1) All Post Treatment Sampling costs are presented in costs per number of samples and shipments required per year - costs are presented as annual O&M costs

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 4
ALTERNATIVE SCS-4C: SOIL VAPOR EXTRACTION (SVE) / GRANULAR ACTIVATED CARBON
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
General	
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
Soil Vapor Extraction (SVE)	
SVE well installation	Cost associated with installation of SVE wells. Based on CDM experience.
	Vendor: includes blower, exp motor, inline air filter, silencers, duction valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mnting,
SVE main system	interconnecting piping and a manual motor start switch
SVE control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel pipe	based on CDM experience
4" carbon steel pipe	based on CDM experience
excavation for piping placement (5 foot depth)	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon. personnel use)
electrical power requirements (10 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
SVE treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
air/water separator tank	Based on CDM experience
catalytic oxidizer/thermal treatment	Based on vendor estimates
Granular Activated Carbon (GAC)	
Vapor Phase Carbon	Vendor estimate - Carbtrol (May 2000)
First Year Vapor Phase Carbon Regeneration	Vendor estimate - Carbtrol (May 2000)
First Year Vapor Phase Carbon Disposal	Vendor estimate - Carbtrol (May 2000)
First Year Vapor Phase Carbon Sampling	Vendor estimate - Carbtrol (May 2000)
Soil Vapor Extraction (SVE) - Ongoing	
Regeneration	Vendor estimate - Carbtrol (May 2000)
Disposal	Vendor estimate - Carbtrol (May 2000)
Sampling	Vendor estimate - Carbtrol (May 2000)
Monitoring and Testing	
Test Kits/ Field Screening (per year)	Based on CDM experience and average test kit costs - ~25 samples per test kit; samples collected on a grid of 1 sample/250 cy contam. mat'l; 1 sampling grid per 2 weeks
Laboratory Analysis (VOCs, N, P) (per year)	Based on 1998 sample analysis costs from Midwest laboratories; samples collected on a grid of 1 sample/250cy contam. material; 1 sampling grid per month (including QA/QC samples)
shipping and handling (per year)	Costs associated with transporting samples from site to laboratory twice per month

APPENDIX D.2

DETAILED COST BACKUP

CATALYTIC OXIDATION VS. GRANULAR ACTIVATED CARBON

ALTERNATIVE SCS-7E

TABLE 7-9
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FOCUSED FEASIBILITY STUDY

SOURCE AREA 7

**ALTERNATIVE SCS-7E: SOIL VAPOR EXTRACTION (SVE)/AIR SPARGING (AS) ALONG SOURCE
 AREA / MONITORING / GROUNDWATER USE RESTRICTIONS / CATALYTIC OXIDATION
 COST SUMMARY**

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
General	\$167,000
Leachate Monitoring Wells	\$120,000
VRS/Catalytic Oxidation System	\$976,000
Air Sparging	\$694,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$1,982,000
Bid Contingency (15%)	\$297,000
Scope Contingency (20%)	\$396,000
Engineering and Design (15%)	\$297,000
Oversight/Health and Safety (5%)	\$99,000
TOTAL CAPITAL COSTS	\$3,071,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$24,000
VRS Regular Maintenance/Electrical	\$63,000
Leachate Sampling and Analysis (per event)	\$28,000
Catalytic Oxidation Maintenance	\$109,000
Regular System Maintenance/Electrical	\$96,000
TOTAL ANNUAL COSTS	\$320,000
REPLACEMENT COSTS	
Leachate Monitoring Wells (every 15 years)	\$29,000
Equipment Replacement (e.g., motors, blowers) - every 15 years	\$30,000
TOTAL REPLACEMENT COSTS ⁽²⁾	\$59,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$3,071,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$2,051,000
Leachate Sampling	
Quarterly Sampling - years 1 and 2	\$207,000
Semi-annual Sampling - years 3 through 10	\$295,000
Present Worth Replacement Costs ⁽⁵⁾	\$0
TOTAL PRESENT WORTH	\$5,624,000

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over 10 years.

(5) Present worth of replacement costs is based on a 7% annual discount rate and no replacement of leachate monitoring wells and system equipment.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
ALTERNATIVE SCL-7E: SOIL VAPOR EXTRACTION (SVE)/AIR SPARGING (AS) ALONG GMZ BOUNDARY AND SOURCE AREA / MONITORING /
GROUNDWATER USE RESTRICTIONS / CATALYTIC OXIDATION
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
<i>legal fees</i>	ls	1	\$25,000	\$25,000			
<i>construction trailer (rental and delivery)</i>	mo	3	\$275	\$825			
<i>mobilization</i>	ls	1	\$1,000	\$1,000			
<i>demobilization</i>	ls	1	\$1,000	\$1,000			
<i>decon facilities</i>	ea	1	\$1,000	\$1,000			
<i>health and safety equipment</i>	mo	3	\$2,000	\$6,000		\$24,000	
<i>electrical power service connection</i>	ls	1	\$5,000	\$5,000			
<i>electrical power service supply</i>	mo	3	\$400	\$1,200			
<i>water supply</i>	mo	3	\$200	\$600			
<i>Pilot Scale Study</i>	ls	1	\$150,000	\$60,000	\$40,000		\$50,000
<i>Leachate - monitoring well installation and materials</i>	well	5	\$6,000		\$30,000		
<i>Performance Monitoring well installation and materials</i>	well	15	\$6,000		\$90,000		
<i>labor</i>	hours	40	\$60			\$2,400	
<i>vehicle</i>	day	2	\$60			\$120	
<i>equipment</i>	ls	1	\$600			\$600	
<i>miscellaneous</i>	ls	1	\$1,000			\$500	
<i>Leachate laboratory analysis</i>	each	20	\$230			\$4,600	
<i>quarterly reports</i>	each	4	\$5,000			\$20,000	
<i>VRS well installation</i>	ea	16	\$6,000		\$96,000		
<i>VRS main system</i>	ls	2	\$50,000	\$100,000	\$20,000	\$20,000	\$25,000
<i>VRS control panels</i>	ls	2	\$10,000	\$20,000	\$1,000	\$4,000	
<i>6" carbon steel piping</i>	ft	3000	\$57	\$171,000		\$5,000	
<i>4" carbon steel piping</i>	ft	500	\$32	\$16,000		\$3,200	
<i>excavation for piping placement</i>	ft	3500	\$4.41		\$15,435		
<i>electrical power requirements (10 HP)</i>	yr.	1	\$20,000			\$20,000	
<i>VRS treatment building</i>	sf	1200	\$180	\$216,000	included		
<i>air/water separator tank</i>	ls	2	\$10,000	\$20,000		\$4,000	
<i>air/water separator tank - condensate disposal</i>	gal	260	\$25			\$6,500	
<i>Catalytic Oxidation Unit</i>	ls	1	\$276,000	\$276,000	included	\$10,000	
<i>Natural Gas</i>	ls	1	\$43,800			\$43,800	
<i>Catalyst Replacement</i>	ea	3	\$38,400			\$11,520	
<i>Sampling</i>	ea	8	\$5,500			\$44,000	
<i>AS well installation</i>	ea	57	\$6,000		\$342,000		
<i>AS main system</i>	ls	1	\$100,000	\$100,000	\$20,000	\$20,000	\$25,000
<i>AS control panels</i>	ls	1	\$3,000	\$3,000	\$1,500	\$600	
<i>6" carbon steel piping</i>	ft	3000	\$57	\$171,000		\$34,200	
<i>4" carbon steel piping</i>	ft	500	\$32	\$16,000		\$3,200	
<i>excavation for piping placement</i>	ft	3500	\$4.41		\$15,435		
<i>condensate disposal</i>	gal	520	\$25			\$13,000	
<i>electrical power requirements (25 HP)</i>	year	1	\$25,000			\$25,000	
<i>AS treatment building</i>	Costs for AS treatment building included with corresponding VRS						
<i>air/water separator tank</i>	Costs for air/water separator tank included with corresponding VRS						
<i>catalytic oxidation treatment</i>	Costs for catalytic oxidation treatment included with corresponding VRS						

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
ALTERNATIVE SCL-7E: SOIL VAPOR EXTRACTION (SVE)/AIR SPARGING (AS) ALONG GMZ BOUNDARY AND SOURCE AREA /
MONITORING / GROUNDWATER USE RESTRICTIONS / CATALYTIC OXIDATION
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
CONSTRUCTION / INSTALLATION	
legal fees	Cost based on CDM experience
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
electrical power service connection	Based on CDM experience
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
Leachate monitoring well installation and materials	Cost based on CDM experience in monitoring well installation
Performance monitoring well installation and materials	Cost based on CDM experience in monitoring well installation
OPERATION / MAINTENANCE	
labor	Based on 10 hour work day at the average CDM labor rate of \$60 for oversite personnel
vehicle	Based on \$300/week rental fee for a field vehicle
equipment	Based on CDM equipment rental rates
miscellaneous	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
leachate laboratory analysis	Based on average cost incurred for VOC analysis; One duplicate and one blank will be collected per 10 samples.
VEGETATION / REMEDIATION	
VRS well installation	Cost associated with installation of SVE wells. Based on CDM experience.
VRS main system	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mounting, interconnecting piping and a manual motor start switch
VRS control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel pipe	Based on CDM experience
4" carbon steel pipe	Based on CDM experience
excavation for piping placement (4 foot depth)	12" wide trench and backfill, 48" deep as per 2000 Means
electrical power requirements (10 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
VRS treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
air/water separator tank	Based on CDM experience
air/water separator tank - condensate disposal	Based on CDM experience
CATALYTIC OXIDATION	
Catalytic Oxidation Unit	Vendor estimate - Global Technologies, Inc (May 2000)
Natural Gas	Vendor estimate - Global Technologies, Inc (May 2000)
Catalyst Replacement	Vendor estimate - Global Technologies, Inc (May 2000)
Sampling	Based on CDM experience
AIR SPARGING	
AS well installation	Cost associated with installation of AS wells. Based on CDM experience.
AS main system	Vendor: includes blower, exp motor, inline silencer, pressure relief valve, unitized base, pressure gauge and a manual motor starting switch.
AS control panels	Vendor estimate
6" carbon steel piping	Based on CDM experience
4" carbon steel piping	Based on CDM experience
excavation for piping placement	12" wide trench and backfill, 48" deep as per 2000 Means
condensate disposal	Based on CDM experience
electrical power requirements (25 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
AS treatment building	Costs for AS treatment building included with corresponding VRS
air/water separator tank	Costs for air/water separator tank included with corresponding VRS
catalytic oxidation treatment	Costs for catalytic oxidation treatment included with corresponding VRS

TABLE 7-9
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FOCUSED FEASIBILITY STUDY

SOURCE AREA 7

ALTERNATIVE SCS-7E: SOIL VAPOR EXTRACTION (SVE)/AIR SPARGING (AS) ALONG SOURCE AREA / MONITORING / GROUNDWATER USE RESTRICTIONS / CATALYTIC OXIDATION (YEAR 0 - 6 MONTHS) / GRANULAR ACTIVATED CARBON (6 MONTHS - YEAR 10)
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
General	\$167,000
Leachate Monitoring Wells	\$120,000
VRS/Catalytic Oxidation System	\$976,000
Granular Activated Carbon	\$24,000
Air Sparging	\$694,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$2,006,000
Bid Contingency (15%)	\$301,000
Scope Contingency (20%)	\$401,000
Engineering and Design (15%)	\$301,000
Oversight/Health and Safety (5%)	\$100,000
TOTAL CAPITAL COSTS	\$3,109,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$24,000
VRS Regular Maintenance/Electrical	\$63,000
Leachate Sampling and Analysis (per event)	\$28,000
Catalytic Oxidation System Maintenance	\$76,000
Granular Activated Carbon Maintenance	\$399,000
Regular System Maintenance/Electrical	\$96,000
TOTAL ANNUAL COSTS	\$686,000
REPLACEMENT COSTS	
Leachate Monitoring Wells (every 15 years)	\$29,000
Equipment Replacement (e.g., motors, blowers) - every 15 years	\$30,000
TOTAL REPLACEMENT COSTS ⁽²⁾	\$59,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$3,109,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$3,929,000.00
Leachate Sampling	
Quarterly Sampling - years 1 and 2	\$207,000
Semi-annual Sampling - years 3 through 10	\$295,000
Present Worth Replacement Costs ⁽⁵⁾	\$0
TOTAL PRESENT WORTH	\$7,540,000

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over 10 years.

(5) Present worth of replacement costs is based on a 7% annual discount rate and no replacement of leachate monitoring wells and system equipment.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
ALTERNATIVE SCS-7E: SOIL VAPOR EXTRACTION (SVE)/AIR SPARGING (AS) ALONG SOURCE AREA / MONITORING / GROUNDWATER USE
RESTRICTIONS / CATALYTIC OXIDATION (YEAR 0 - 6 MONTHS) / GRANULAR ACTIVATED CARBON (6 MONTHS - YEAR 10)
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
<i>legal fees</i>	ls	1	\$25,000	\$25,000			
<i>construction trailer (rental and delivery)</i>	mo	3	\$275	\$825			
<i>mobilization</i>	ls	1	\$1,000	\$1,000			
<i>dismobilization</i>	ls	1	\$1,000	\$1,000			
<i>decon facilities</i>	ea	1	\$1,000	\$1,000			
<i>health and safety equipment</i>	mo	3	\$2,000	\$6,000		\$24,000	
<i>electrical power service connection</i>	ls	1	\$5,000	\$5,000			
<i>electrical power service supply</i>	mo	3	\$400	\$1,200			
<i>water supply</i>	mo	3	\$200	\$600			
<i>Pilot Scale Study</i>	ls	1	\$150,000	\$60,000	\$40,000		\$50,000
<i>Leechate - monitoring well installation and materials</i>	well	5	\$6,000		\$30,000		
<i>Performance Monitoring well installation and materials</i>	well	15	\$6,000		\$90,000		
<i>labor</i>	hours	40	\$60			\$2,400	
<i>vehicle</i>	day	2	\$60			\$120	
<i>equipment</i>	ls	1	\$600			\$600	
<i>miscellaneous</i>	ls	1	\$1,000			\$500	
<i>Leechate laboratory analysis</i>	each	20	\$230			\$4,600	
<i>quarterly reports</i>	each	4	\$5,000			\$20,000	
<i>VRS well installation</i>	ea	16	\$6,000		\$96,000		
<i>VRS main system</i>	ls	2	\$50,000	\$100,000	\$20,000	\$20,000	\$25,000
<i>VRS control panels</i>	ls	2	\$10,000	\$20,000	\$1,000	\$4,000	
<i>6" carbon steel piping</i>	ft	3000	\$57	\$171,000		\$5,000	
<i>4" carbon steel piping</i>	ft	500	\$32	\$16,000		\$3,200	
<i>excavation for piping placement</i>	ft	3500	\$4.41		\$15,435		
<i>electrical power requirements (10 HP)</i>	yr.	1	\$20,000			\$20,000	
<i>VRS treatment building</i>	sf	1200	\$180	\$216,000	Included		
<i>air/water separator tank</i>	ls	2	\$10,000	\$20,000		\$4,000	
<i>air/water separator tank - condensate disposal</i>	gal	260	\$25			\$6,500	
<i>Catalytic Oxidation Unit</i>	ls	1	\$276,000	\$276,000	Included	\$10,000	
<i>Natural Gas</i>	ls	1	\$21,900			\$21,900	
<i>Sampling</i>	ea	8	\$5,500			\$44,000	
<i>Vapor Phase Carbon</i>	ea	2	\$12,000	\$24,000			
<i>Regeneration</i>	lb	22.00	\$12,000			\$264,000	
<i>Disposal</i>	lb	50600	\$3			\$126,500	
<i>Sampling</i>	ea	22.00	\$400			\$8,800	
<i>AS well installation</i>	ea	57	\$6,000		\$342,000		
<i>AS main system</i>	ls	1	\$100,000	\$100,000	\$20,000	\$20,000	\$25,000
<i>AS control panels</i>	ls	1	\$3,000	\$3,000	\$1,500	\$600	
<i>6" carbon steel piping</i>	ft	3000	\$57	\$171,000		\$34,200	
<i>4" carbon steel piping</i>	ft	500	\$32	\$16,000		\$3,200	
<i>excavation for piping placement</i>	ft	3500	\$4.41		\$15,435		
<i>condensate disposal</i>	gal	520	\$25			\$13,000	
<i>electrical power requirements (25 HP)</i>	year	1	\$25,000			\$25,000	
<i>AS treatment building</i>	Costs for AS treatment building included with corresponding VRS						
<i>air/water separator tank</i>	Costs for air/water separator tank included with corresponding VRS						
<i>catalytic oxidation treatment</i>	Costs for catalytic oxidation treatment included with corresponding VRS						

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
ALTERNATIVE SCS-7E: SOIL VAPOR EXTRACTION (SVE)/AIR SPARGING (AS) ALONG SOURCE AREA / MONITORING / GROUNDWATER USE
RESTRICTIONS / CATALYTIC OXIDATION (YEAR 0 - 6 MONTHS) / GRANULAR ACTIVATED CARBON (6 MONTHS - YEAR 10)
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
GENERAL CONSTRUCTION	
legal fees	Cost based on CDM experience
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
electrical power service connection	Based on CDM experience
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
Leachate Monitoring	
Leachate monitoring well installation and materials	Cost based on CDM experience in monitoring well installation
Performance monitoring well installation and materials	Cost based on CDM experience in monitoring well installation
VEHICLE AND EQUIPMENT	
labor	Based on 10 hour work day at the average CDM labor rate of \$60 for oversite personnel
vehicle	Based on \$300/week rental fee for a field vehicle
equipment	Based on CDM equipment rental rates
miscellaneous	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
leachate laboratory analysis	Based on average cost incurred for VOC analysis; One duplicate and one blank will be collected per 10 samples.
VAPOR PHASE CARBON (VPC) SYSTEM	
VRS well installation	Cost associated with installation of SVE wells. Based on CDM experience.
VRS main system	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mnting, interconnecting piping and a manual motor start switch
VRS control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel pipe	Based on CDM experience
4" carbon steel pipe	Based on CDM experience
excavation for piping placement (4 foot depth)	12" wide trench and backfill, 48" deep as per 2000 Means
electrical power requirements (10 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
VRS treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
air/water separator tank	Based on CDM experience
air/water separator tank - condensate disposal	Based on CDM experience
catalytic oxidation	Based on CDM experience
Natural Gas	Based on CDM experience
CATALYTIC OXIDATION UNIT	
Catalytic Oxidation Unit	Vendor estimate - Global Technologies, Inc (May 2000)
Natural Gas	Vendor estimate - Global Technologies, Inc (May 2000)
Sampling	Based on CDM experience
GRANULAR ACTIVATED CARBON (GAC) SYSTEM	
Vapor Phase Carbon	Vendor estimate - Carbtrol (May 2000)
Regeneration	Vendor estimate - Carbtrol (May 2000)
Disposal	Vendor estimate - Carbtrol (May 2000)
Sampling	Vendor estimate - Carbtrol (May 2000)
AIR SPARGING (AS) SYSTEM	
AS well installation	Cost associated with installation of AS wells. Based on CDM experience.
AS main system	Vendor: includes blower, exp motor, inline silencer, pressure relief valve, unitized base, pressure gauge and a manual motor starting switch.
AS control panels	Vendor estimate
6" carbon steel piping	Based on CDM experience
4" carbon steel piping	Based on CDM experience
excavation for piping placement	12" wide trench and backfill, 48" deep as per 2000 Means
condensate disposal	Based on CDM experience
electrical power requirements (25 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
AS treatment building	Costs for AS treatment building included with corresponding VRS
air/water separator tank	Costs for air/water separator tank included with corresponding VRS
catalytic oxidation treatment	Costs for catalytic oxidation treatment included with corresponding VRS

TABLE 7-9
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FOCUSED FEASIBILITY STUDY

SOURCE AREA 7

ALTERNATIVE SCS-7E: SOIL VAPOR EXTRACTION (SVE)/AIR SPARGING (AS) ALONG SOURCE AREA / MONITORING / GROUNDWATER USE RESTRICTIONS / CATALYTIC OXIDATION (YEAR 0-YEAR 1) / GRANULAR ACTIVATED CARBON (YEAR 1- YEAR 10)
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
General	\$167,000
Leachate Monitoring Wells	\$120,000
VRS/Catalytic Oxidation System	\$976,000
Granular Activated Carbon	\$24,000
Air Sparging	\$694,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$2,006,000
Bid Contingency (15%)	\$301,000
Scope Contingency (20%)	\$401,000
Engineering and Design (15%)	\$301,000
Oversight/Health and Safety (5%)	\$100,000
TOTAL CAPITAL COSTS	\$3,109,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$24,000
VRS Regular Maintenance/Electrical	\$63,000
Leachate Sampling and Analysis (per event)	\$28,000
Catalytic Oxidation System Maintenance	\$98,000
Granular Activated Carbon Maintenance	\$399,000
Regular System Maintenance/Electrical	\$96,000
TOTAL ANNUAL COSTS	\$708,000
REPLACEMENT COSTS	
Leachate Monitoring Wells (every 15 years)	\$29,000
Equipment Replacement (e.g., motors, blowers) - every 15 years	\$30,000
TOTAL REPLACEMENT COSTS ⁽²⁾	\$59,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$3,109,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$3,806,000.00
Leachate Sampling	
Quarterly Sampling - years 1 and 2	\$207,000
Semi-annual Sampling - years 3 through 10	\$295,000
Present Worth Replacement Costs ⁽⁵⁾	\$0
TOTAL PRESENT WORTH	\$7,417,000

- (1) Capital costs for construction items do not include oversight fees, which are accounted for separately.
(2) Replacement costs include construction and oversight capital costs.
(3) Capital costs represent the present worth of the given alternative.
(4) Present worth of annual O&M costs is based on a 7% discount rate over 10 years.
(5) Present worth of replacement costs is based on a 7% annual discount rate and no replacement of leachate monitoring wells and system equipment.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7

**ALTERNATIVE SCS-7E: SOIL VAPOR EXTRACTION (SVE)/AIR SPARGING (AS) ALONG SOURCE AREA / MONITORING / GROUNDWATER USE
RESTRICTIONS / CATALYTIC OXIDATION (YEAR 0- YEAR 1) / GRANULAR ACTIVATED CARBON (YEAR 1- YEAR 10)
DETAILED COST ESTIMATE**

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
<i>legal fees</i>	ls	1	\$25,000	\$25,000			
<i>construction trailer (rental and delivery)</i>	mo	3	\$275	\$825			
<i>mobilization</i>	ls	1	\$1,000	\$1,000			
<i>demobilization</i>	ls	1	\$1,000	\$1,000			
<i>decon facilities</i>	ea	1	\$1,000	\$1,000			
<i>health and safety equipment</i>	mo	3	\$2,000	\$6,000		\$24,000	
<i>electrical power service connection</i>	ls	1	\$5,000	\$5,000			
<i>electrical power service supply</i>	mo	3	\$400	\$1,200			
<i>water supply</i>	mo	3	\$200	\$600			
<i>Pilot Scale Study</i>	ls	1	\$150,000	\$60,000	\$40,000		\$50,000
<i>Leachate - monitoring well installation and materials</i>	well	5	\$6,000		\$30,000		
<i>Performance Monitoring well installation and materials</i>	well	15	\$6,000		\$90,000		
<i>labor</i>	hours	40	\$60			\$2,400	
<i>vehicle</i>	day	2	\$60			\$120	
<i>equipment</i>	ls	1	\$600			\$600	
<i>miscellaneous</i>	ls	1	\$1,000			\$500	
<i>Leachate laboratory analysis</i>	each	20	\$230			\$4,600	
<i>quarterly reports</i>	each	4	\$5,000			\$20,000	
<i>VRS well installation</i>	ea.	16	\$6,000		\$96,000		
<i>VRS main system</i>	ls	2	\$50,000	\$100,000	\$20,000	\$20,000	\$25,000
<i>VRS control panels</i>	ls	2	\$10,000	\$20,000	\$1,000	\$4,000	
<i>6" carbon steel piping</i>	ft	3000	\$57	\$171,000		\$5,000	
<i>4" carbon steel piping</i>	ft	500	\$32	\$16,000		\$3,200	
<i>excavation for piping placement</i>	ft	3500	\$4.41		\$15,435		
<i>electrical power requirements (10 HP)</i>	yr.	1	\$20,000			\$20,000	
<i>VRS treatment building</i>	sf	1200	\$180	\$216,000	included		
<i>air/water separator tank</i>	ls	2	\$10,000	\$20,000		\$4,000	
<i>air/water separator tank - condensate disposal</i>	gal	260	\$25			\$6,500	
<i>Catalytic Oxidation Unit</i>	ls	1	\$276,000	\$276,000	included	\$10,000	
<i>Natural Gas</i>	ls	1	\$43,800			\$43,800	
<i>Sampling</i>	ea	8	\$5,500			\$44,000	
<i>Vapor Phase Carbon</i>	ea	2	\$12,000	\$24,000			
<i>Regeneration</i>	lb	22.00	\$12,000			\$264,000	
<i>Disposal</i>	lb	50600	\$3			\$126,500	
<i>Sampling</i>	ea	22.00	\$400			\$8,800	
<i>AS well installation</i>	ea	57	\$6,000		\$342,000		
<i>AS main system</i>	ls	1	\$100,000	\$100,000	\$20,000	\$20,000	\$25,000
<i>AS control panels</i>	ls	1	\$3,000	\$3,000	\$1,500	\$600	
<i>6" carbon steel piping</i>	ft	3000	\$57	\$171,000		\$34,200	
<i>4" carbon steel piping</i>	ft	500	\$32	\$16,000		\$3,200	
<i>excavation for piping placement</i>	ft	3500	\$4.41		\$15,435		
<i>condensate disposal</i>	gal	520	\$25			\$13,000	
<i>electrical power requirements (25 HP)</i>	year	1	\$25,000			\$25,000	
<i>AS treatment building</i>	Costs for AS treatment building included with corresponding VRS						
<i>air/water separator tank</i>	Costs for air/water separator tank included with corresponding VRS						
<i>catalytic oxidation treatment</i>	Costs for catalytic oxidation treatment included with corresponding VRS						

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7

**ALTERNATIVE SCS-7E: SOIL VAPOR EXTRACTION (SVE)/AIR SPARGING (AS) ALONG SOURCE AREA / MONITORING / GROUNDWATER USE
RESTRICTIONS / CATALYTIC OXIDATION (YEAR 0- YEAR 1) / GRANULAR ACTIVATED CARBON (YEAR 1- YEAR 10)
DETAILED COST ESTIMATE - COMMENTS**

COST COMPONENT	COMMENTS
Construction	
legal fees	Cost based on CDM experience
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
electrical power service connection	Based on CDM experience
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
Monitoring	
Leachate monitoring well installation and materials	Cost based on CDM experience in monitoring well installation
Performance monitoring well installation and materials	Cost based on CDM experience in monitoring well installation
Analysis	
labor	Based on 10 hour work day at the average CDM labor rate of \$60 for oversite personnel
vehicle	Based on \$300/week rental fee for a field vehicle
equipment	Based on CDM equipment rental rates
miscellaneous	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
leachate laboratory analysis	Based on average cost incurred for VOC analysis; One duplicate and one blank will be collected per 10 samples.
Vapor Phase Carbon	
VRS well installation	Cost associated with installation of SVE wells. Based on CDM experience.
VRS main system	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mnting, interconnecting piping and a manual motor start switch
VRS control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel pipe	Based on CDM experience
4" carbon steel pipe	Based on CDM experience
excavation for piping placement (4 foot depth)	12" wide trench and backfill, 48" deep as per 2000 Means
electrical power requirements (10 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
VRS treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
air/water separator tank	Based on CDM experience
air/water separator tank - condensate disposal	Based on CDM experience
Catalytic Oxidation Unit	
Natural Gas	Vendor estimate - Global Technologies, Inc (May 2000)
Sampling	Based on CDM experience
Granular Activated Carbon	
Vapor Phase Carbon	Vendor estimate - Carbtrol (May 2000)
Regeneration	Vendor estimate - Carbtrol (May 2000)
Disposal	Vendor estimate - Carbtrol (May 2000)
Sampling	Vendor estimate - Carbtrol (May 2000)
Air Sparging	
AS well installation	Cost associated with installation of AS wells. Based on CDM experience.
AS main system	Vendor: includes blower, exp motor, inline silencer, pressure relief valve, unitized base, pressure gauge and a manual motor starting switch.
AS control panels	Vendor estimate
6" carbon steel piping	Based on CDM experience
4" carbon steel piping	Based on CDM experience
excavation for piping placement	12" wide trench and backfill, 48" deep as per 2000 Means
condensate disposal	Based on CDM experience
electrical power requirements (25 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
AS treatment building	Costs for AS treatment building included with corresponding VRS
air/water separator tank	Costs for air/water separator tank included with corresponding VRS
catalytic oxidation treatment	Costs for catalytic oxidation treatment included with corresponding VRS

**TABLE 7-9
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FOCUSED FEASIBILITY STUDY**

SOURCE AREA 7

**ALTERNATIVE SCS-7E: SOIL VAPOR EXTRACTION (SVE)/AIR SPARGING (AS) ALONG SOURCE
AREA / MONITORING / GROUNDWATER USE RESTRICTIONS / GRANULAR ACTIVATED CARBON
COST SUMMARY**

Item/Description	Total Cost
CAPITAL COSTS	
Groundwater Use Restrictions	\$25,000
General	\$167,000
Leachate Monitoring Wells	\$120,000
Granular Activated Carbon	\$24,000
VRS	\$700,000
Air Sparging	\$694,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$1,730,000
Bid Contingency (15%)	\$260,000
Scope Contingency (20%)	\$346,000
Engineering and Design (15%)	\$260,000
Oversight/Health and Safety (5%)	\$87,000
TOTAL CAPITAL COSTS	\$2,683,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$24,000
VRS Regular Maintenance/Electrical	\$63,000
Leachate Sampling and Analysis (per event)	\$28,000
Granular Activated Carbon Maintenance (Year 0-Year1)	\$2,214,300
Granular Activated Carbon Maintenance (Year 1-Year10)	\$399,000
Regular System Maintenance/Electrical	\$96,000
TOTAL ANNUAL COSTS	\$2,824,300
REPLACEMENT COSTS	
Leachate Monitoring Wells (every 15 years)	\$29,000
Equipment Replacement (e.g., motors, blowers) - every 15 years	\$30,000
TOTAL REPLACEMENT COSTS ⁽²⁾	\$59,000
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$2,683,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$5,928,300.00
Leachate Sampling	
Quarterly Sampling - years 1 and 2	\$207,000
Semi-annual Sampling - years 3 through 10	\$295,000
Present Worth Replacement Costs ⁽⁵⁾	\$0
TOTAL PRESENT WORTH	\$9,113,300

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over 10 years.

(5) Present worth of replacement costs is based on a 7% annual discount rate and no replacement of leachate monitoring wells and system equipment.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
ALTERNATIVE SCS-7E: SOIL VAPOR EXTRACTION (SVE)/AIR SPARGING (AS) ALONG SOURCE AREA / MONITORING / GROUNDWATER USE
RESTRICTIONS / GRANULAR ACTIVATED CARBON
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
legal fees	ls	1	\$25,000	\$25,000			
construction trailer (rental and delivery)	mo	3	\$275	\$825			
mobilization	ls	1	\$1,000	\$1,000			
demobilization	ls	1	\$1,000	\$1,000			
decon facilities	ea	1	\$1,000	\$1,000			
health and safety equipment	mo	3	\$2,000	\$6,000		\$24,000	
electrical power service connection	ls	1	\$5,000	\$5,000			
electrical power service supply	mo	3	\$400	\$1,200			
water supply	mo	3	\$200	\$600			
Pilot Scale Study	ls	1	\$150,000	\$60,000	\$40,000		\$50,000
Leachate - monitoring well installation and materials	well	5	\$6,000		\$30,000		
Performance Monitoring well installation and materials	well	15	\$6,000		\$90,000		
labor	hours	40	\$60			\$2,400	
vehicle	day	2	\$60			\$120	
equipment	ls	1	\$600			\$600	
miscellaneous	ls	1	\$1,000			\$500	
Leachate laboratory analysis	each	20	\$230			\$4,600	
quarterly reports	each	4	\$5,000			\$20,000	
VRS well installation	ea	16	\$6,000		\$96,000		
VRS main system	ls	2	\$50,000	\$100,000	\$20,000	\$20,000	\$25,000
VRS control panels	ls	2	\$10,000	\$20,000	\$1,000	\$4,000	
6" carbon steel piping	ft	3000	\$57	\$171,000		\$5,000	
4" carbon steel piping	ft	500	\$32	\$16,000		\$3,200	
excavation for piping placement	ft	3500	\$4.41		\$15,435		
electrical power requirements (10 HP)	yr.	1	\$20,000			\$20,000	
VRS treatment building	sf	1200	\$180	\$216,000	included		
air/water separator tank	ls	2	\$10,000	\$20,000		\$4,000	
air/water separator tank - condensate disposal	gal	260	\$25			\$6,500	
Vapor Phase Carbon	ea	2	\$12,000	\$24,000			
First Year Vapor Phase Carbon Regeneration	lb	122.00	\$12,000			\$1,464,000	
First Year Vapor Phase Carbon Disposal	lb	260800	\$3			\$701,500	
First Year Vapor Phase Carbon Sampling	ea	122.00	\$400			\$48,800	
Regeneration	lb	22.00	\$12,000			\$264,000	
Disposal	lb	50800	\$3			\$126,500	
Sampling	ea	22.00	\$400			\$8,800	
AS well installation	ea	57	\$6,000		\$342,000		
AS main system	ls	1	\$100,000	\$100,000	\$20,000	\$20,000	\$25,000
AS control panels	ls	1	\$3,000	\$3,000	\$1,500	\$600	
6" carbon steel piping	ft	3000	\$57	\$171,000		\$34,200	
4" carbon steel piping	ft	500	\$32	\$16,000		\$3,200	
excavation for piping placement	ft	3500	\$4.41		\$15,435		
condensate disposal	gal	520	\$25			\$13,000	
electrical power requirements (25 HP)	year	1	\$25,000			\$25,000	
electrical power requirements (25 HP)	Costs for AS treatment building included with corresponding VRS						
air/water separator tank	Costs for air/water separator tank included with corresponding VRS						
catalytic oxidation treatment	Costs for catalytic oxidation treatment included with corresponding VRS						

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 7
ALTERNATIVE SCS-7E: SOIL VAPOR EXTRACTION (SVE)/AIR SPARGING (AS) ALONG SOURCE AREA / MONITORING / GROUNDWATER
USE RESTRICTIONS / GRANULAR ACTIVATED CARBON
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
Construction / Installation	
legal fees	Cost based on CDM experience
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
electrical power service connection	Based on CDM experience
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
Monitoring / Maintenance	
Leachate monitoring well installation and materials	Cost based on CDM experience in monitoring well installation
Performance monitoring well installation and materials	Cost based on CDM experience in monitoring well installation
Operational / Support	
labor	Based on 10 hour work day at the average CDM labor rate of \$60 for oversite personnel
vehicle	Based on \$300/week rental fee for a field vehicle
equipment	Based on CDM equipment rental rates
miscellaneous	Incidental expenses (minor repairs, replacement of equipment, local purchases, etc)
leachate laboratory analysis	Based on average cost incurred for VOC analysis; One duplicate and one blank will be collected per 10 samples.
Vapor Phase Carbon	
VRS well installation	Cost associated with installation of SVE wells. Based on CDM experience.
VRS main system	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mntng, interconnecting piping and a manual motor start switch
VRS control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel pipe	Based on CDM experience
4" carbon steel pipe	Based on CDM experience
excavation for piping placement (4 foot depth)	12" wide trench and backfill, 48" deep as per 2000 Means
electrical power requirements (10 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
VRS treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
air/water separator tank	Based on CDM experience
air/water separator tank - condensate disposal	Based on CDM experience
Granular Activated Carbon	
Vapor Phase Carbon	Vendor estimate - Carbtrol (May 2000)
First Year Vapor Phase Carbon Regeneration	Vendor estimate - Carbtrol (May 2000)
First Year Vapor Phase Carbon Disposal	Vendor estimate - Carbtrol (May 2000)
First Year Vapor Phase Carbon Sampling	Vendor estimate - Carbtrol (May 2000)
Regeneration / Disposal / Sampling	
Regeneration	Vendor estimate - Carbtrol (May 2000)
Disposal	Vendor estimate - Carbtrol (May 2000)
Sampling	Vendor estimate - Carbtrol (May 2000)
Air Sparging / AS	
AS well installation	Cost associated with installation of AS wells. Based on CDM experience.
AS main system	Vendor: includes blower, exp motor, inline silencer, pressure relief valve, unitized base, pressure gauge and a manual motor starting switch.
AS control panels	Vendor estimate
6" carbon steel piping	Based on CDM experience
4" carbon steel piping	Based on CDM experience
excavation for piping placement	12" wide trench and backfill, 48" deep as per 2000 Means
condensate disposal	Based on CDM experience
electrical power requirements (25 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
AS treatment building	Costs for AS treatment building included with corresponding VRS
air/water separator tank	Costs for air/water separator tank included with corresponding VRS
catalytic oxidation treatment	Costs for catalytic oxidation treatment included with corresponding VRS

APPENDIX D.3

DETAILED COST BACKUP

CATALYTIC OXIDATION VS. GRANULAR ACTIVATED CARBON

ALTERNATIVE SCS-11C

TABLE 7-15
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 11
ALTERNATIVE SCS-11C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
General	\$3,000
Soil Vapor Extraction (with emission controls)	\$242,000
Catalytic Oxidation System	\$143,500
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$388,500
Bid Contingency (10%)	\$39,000
Scope Contingency (10%)	\$39,000
Engineering and Design (15%)	\$58,000
Oversight/Health and Safety (5%)	\$19,000
TOTAL CAPITAL COSTS	\$543,500
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$18,000
Regular System Maintenance/Electrical	\$36,000
Catalytic Oxidation System Maintenance	\$68,880
Post Treatment Sampling	\$90,000
TOTAL ANNUAL COSTS	\$212,880
REPLACEMENT COSTS	
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$543,500
Present Worth Annual O&M Costs ⁽⁴⁾	\$2,642,000
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$3,185,500

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.

Note: SVE present worth costs are based on 30 year operation.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 11
ALTERNATIVE SCS-11C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
Construction				\$33,000	\$0	\$10,000	\$0
construction trailer (rental and delivery)	yr	1	\$3,300			\$3,300	
mobilization	ls	1	\$1,000	\$1,000			
demobilization	ls	1	\$1,000	\$1,000			
decon facilities	ea	1	\$1,000	\$1,000			
health and safety equipment	yr	1	\$9,000			\$9,000	
electrical power service supply	yr	1	\$3,600			\$3,600	
water supply	yr	1	\$2,400			\$2,400	
SVE system installation				\$18,000	\$30,000	\$10,000	\$0
SVE well installation	ea	5	\$6,000		\$30,000		
SVE main system	unit	1	\$18,000	\$18,000	\$6,000	\$10,000	
SVE control panels	unit	1	\$3,000	\$3,000	\$1,500	\$500	
6" carbon steel piping	ft	535	\$57	\$30,495			
4" carbon steel piping	ft	100	\$32	\$3,200			
excavation for piping placement	ft	635	\$0.67		\$425		
electrical power requirements (25 HP)	ls	1	\$25,000			\$25,000	
SVE treatment building	sf	800	\$180	\$144,000	included		
air/water separator tank	ls	1	\$5,000	\$5,000		\$500	
Catalytic Oxidation Unit				\$143,500	included	\$10,000	\$0
Natural Gas	ls	1	\$12,000			\$12,000	
Catalyst Replacement	ea	9	\$9,600			\$2,880	
Sampling	ea	8	\$5,500			\$44,000	
Post Treatment Sampling				\$0	\$0	\$9,900	\$0
Test Kits/ Field Screening (per year)	samples	33	\$300			\$9,900	
Laboratory Analysis (VOCs, N, P) (per year)	samples	390	\$200			\$78,000	
shipping and handling (per year)	shipmt	24	\$100			\$2,400	

(1) All Post Treatment Sampling costs are presented in costs per number of samples and shipments required per year - costs are presented as annual O&M costs

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 11
ALTERNATIVE SCS-11C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
Construction Trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
SVE Well Installation	
SVE well installation	Cost associated with installation of SVE wells. Based on CDM experience.
SVE main system	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mntng, interconnecting piping and a manual motor start switch
SVE control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel piping	based on CDM experience
4" carbon steel piping	based on CDM experience
excavation for piping placement	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power requirements (40 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
SVE treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
air/water separator tank	Based on CDM experience
catalytic oxidizer/thermal treatment	Based on vendor estimates
Catalytic Oxidation Unit	Vendor estimate - Global Technologies, Inc. (May 2000)
Natural Gas	Vendor estimate - Global Technologies, Inc. (May 2000)
Catalyst Replacement	Vendor estimate - Global Technologies, Inc. (May 2000)
Sampling	Based on CDM experience
Test Kits/ Field Screening (per year)	Based on CDM experience and average test kit costs - ~25 samples per test kit; samples collected on a grid of 1 sample/250 cy contam. mat'l; 1 sampling grid per 2 weeks
Laboratory Analysis (VOCs, N, P) (per year)	Based on 1998 sample analysis costs from Midwest laboratories; samples collected on a grid of 1 sample/250cy contam. material; 1 sampling grid per month (including QA/QC samples)
shipping and handling (per year)	Costs associated with transporting samples from site to laboratory twice per month

TABLE 7-15
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 11
ALTERNATIVE SCS-11C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION (YEAR 0 - 6 MONTHS) / GRANULAR ACTIVATED CARBON (6 MONTHS - YEAR 30)
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
General	\$3,000
Soil Vapor Extraction (with emission controls)	\$242,000
Catalytic Oxidation System	\$143,500
Granular Activated Carbon	\$24,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$412,500
Bid Contingency (10%)	\$41,000
Scope Contingency (10%)	\$41,000
Engineering and Design (15%)	\$62,000
Oversight/Health and Safety (5%)	\$21,000
TOTAL CAPITAL COSTS	\$577,500
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$18,000
Regular System Maintenance/Electrical	\$36,000
Catalytic Oxidation System Maintenance	\$60,000
Granular Activated Carbon Maintenance	\$50,002
Post Treatment Sampling	\$90,000
TOTAL ANNUAL COSTS	\$254,002
REPLACEMENT COSTS	
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$577,500
Present Worth Annual O&M Costs ⁽⁴⁾	\$2,412,000
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$2,989,500

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.

SCS-11C (SVE) present worth costs are based on 30 year operation.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 11
ALTERNATIVE SCS-11C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION (YEAR 0 - 6 MONTHS) / GRANULAR ACTIVATED CARBON
(6 MONTHS - YEAR 30)
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
CONSTRUCTION							
construction trailer (rental and delivery)	yr	1	\$3,300			\$3,300	
mobilization	ls	1	\$1,000	\$1,000			
demobilization	ls	1	\$1,000	\$1,000			
decon facilities	ea	1	\$1,000	\$1,000			
health and safety equipment	yr	1	\$9,000			\$9,000	
electrical power service supply	yr	1	\$3,600			\$3,600	
water supply	yr	1	\$2,400			\$2,400	
EQUIPMENT							
SVE well installation	ea	5	\$6,000		\$30,000		
SVE main system	unit	1	\$18,000	\$18,000	\$6,000	\$10,000	
SVE control panels	unit	1	\$3,000	\$3,000	\$1,500	\$500	
6" carbon steel piping	ft	535	\$57	\$30,495			
4" carbon steel piping	ft	100	\$32	\$3,200			
excavation for piping placement	ft	635	\$0.67		\$425		
electrical power requirements (25 HP)	ls	1	\$25,000			\$25,000	
SVE treatment building	sf	800	\$180	\$144,000	included		
air/water separator tank	ls	1	\$5,000	\$5,000		\$500	
OPERATION & MAINTENANCE							
Catalytic Oxidation Unit	ls	1	\$143,500	\$143,500	included	\$10,000	
Natural Gas	ls	1	\$6,000			\$6,000	
Sampling	ea	8	\$5,500			\$44,000	
GRANULAR ACTIVATED CARBON							
Vapor Phase Carbon	ea	2	\$12,000	\$24,000			
Regeneration	ea	4.00	\$12,000			\$48,000	
Disposal	lb	160.8	\$3			\$402	
Sampling	ea	4.00	\$400			\$1,600	
TESTING							
Test Kits/ Field Screening (per year)	samples	33	\$300			\$9,900	
Laboratory Analysis (VOCs, N, P) (per year)	samples	390	\$200			\$78,000	
shipping and handling (per year)	shipment	24	\$100			\$2,400	

(1) All Post Treatment Sampling costs are presented in costs per number of samples and shipments required per year - costs are presented as annual O&M costs

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 11
ALTERNATIVE SCS-11C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION (YEAR 0 - 6 MONTHS) / GRANULAR ACTIVATED CARBON (6 MONTHS - YEAR 30)
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
General	
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
Soil Vapor Extraction (SVE)	
SVE well installation	Cost associated with installation of SVE wells. Based on CDM experience.
SVE main system	Vendor: Includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mntng, interconnecting piping and a manual motor start switch
SVE control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel piping	based on CDM experience
4" carbon steel piping	based on CDM experience
excavation for piping placement	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power requirements (40 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/KW-hr
SVE treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
air/water separator tank	Based on CDM experience
catalytic oxidizer/thermal treatment	Based on vendor estimates
Catalytic Oxidation Unit	
Catalytic Oxidation Unit	Vendor estimate - Global Technologies, Inc. (May 2000)
Natural Gas	Vendor estimate - Global Technologies, Inc. (May 2000)
Sampling	Based on CDM experience
Vapor Phase Carbon	
Regeneration	Vendor estimate - Carbtrol (May 2000)
Disposal	Vendor estimate - Carbtrol (May 2000)
Sampling	Vendor estimate - Carbtrol (May 2000)
Test Kits/Field Screening (per year)	
Test Kits/Field Screening (per year)	Based on CDM experience and average test kit costs - ~25 samples per test kit; samples collected on a grid of 1 sample/250 cy contam. mat'l; 1 sampling grid per 2 weeks
Laboratory Analysis (VOCs, N, P) (per year)	Based on 1996 sample analysis costs from Midwest laboratories; samples collected on a grid of 1 sample/250cy contam. material; 1 sampling grid per month (including QA/QC samples)
shipping and handling (per year)	Costs associated with transporting samples from site to laboratory twice per month

TABLE 7-15
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 11
**ALTERNATIVE SCS-11C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION (YEAR 0-
YEAR 1) / GRANULAR ACTIVATED CARBON (YEAR 1- YEAR 30)**
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
General	\$3,000
Soil Vapor Extraction (with emission controls)	\$242,000
Catalytic Oxidation System	\$143,500
Granular Activated Carbon	\$24,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$412,500
Bid Contingency (10%)	\$41,000
Scope Contingency (10%)	\$41,000
Engineering and Design (15%)	\$62,000
Oversight/Health and Safety (5%)	\$21,000
TOTAL CAPITAL COSTS	\$577,500
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$18,000
Regular System Maintenance/Electrical	\$36,000
Catalytic Oxidation System Maintenance	\$66,000
Granular Activated Carbon Maintenance	\$50,002
Post Treatment Sampling	\$90,000
TOTAL ANNUAL COSTS	\$260,002
REPLACEMENT COSTS	
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$577,500
Present Worth Annual O&M Costs ⁽⁴⁾	\$2,422,000
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$2,999,500

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.

SCS-11C SVE present worth costs are based on 30 year operation.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 11
ALTERNATIVE SCS-11C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION (YEAR 0- YEAR 1) / GRANULAR ACTIVATED CARBON (
YEAR 1- YEAR 30)
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
<i>construction trailer (rental and delivery)</i>	yr	1	\$3,300			\$3,300	
<i>mobilization</i>	ls	1	\$1,000	\$1,000			
<i>demobilization</i>	ls	1	\$1,000	\$1,000			
<i>decon facilities</i>	ea	1	\$1,000	\$1,000			
<i>health and safety equipment</i>	yr	1	\$9,000			\$9,000	
<i>electrical power service supply</i>	yr	1	\$3,600			\$3,600	
<i>water supply</i>	yr	1	\$2,400			\$2,400	
<i>SVE well installation</i>	ea	5	\$6,000	\$30,000	\$30,000		
<i>SVE main system</i>	unit	1	\$18,000	\$18,000	\$8,000	\$10,000	
<i>SVE control panels</i>	unit	1	\$3,000	\$3,000	\$1,500	\$500	
<i>6" carbon steel piping</i>	ft	535	\$57	\$30,495			
<i>4" carbon steel piping</i>	ft	100	\$32	\$3,200			
<i>excavation for piping placement</i>	ft	635	\$0.67		\$425		
<i>electrical power requirements (25 HP)</i>	ls	1	\$25,000			\$25,000	
<i>SVE treatment building</i>	sf	800	\$180	\$144,000	included		
<i>air/water separator tank</i>	ls	1	\$5,000	\$5,000		\$500	
<i>Catalytic Oxidation Unit</i>	ls	1	\$143,500	\$143,500	included	\$10,000	
<i>Natural Gas</i>	ls	1	\$12,000			\$12,000	
<i>Sampling</i>	ea	8	\$5,500			\$44,000	
<i>Vapor Phase Carbon</i>	ea	2	\$12,000	\$24,000			
<i>Regeneration</i>	lb	4.00	\$12,000			\$48,000	
<i>Disposal</i>	lb	160.8	\$3			\$402	
<i>Sampling</i>	ea	4.00	\$400			\$1,600	
<i>Test Kits/ Field Screening (per year)</i>	samples	33	\$300			\$9,900	
<i>Laboratory Analysis (VOCs, N, P) (per year)</i>	samples	390	\$200			\$78,000	
<i>shipping and handling (per year)</i>	shipment	24	\$100			\$2,400	

(1) All Post Treatment Sampling costs are presented in costs per number of samples and shipments required per year - costs are presented as annual O&M costs

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 11
ALTERNATIVE SCS-11C: SOIL VAPOR EXTRACTION (SVE) / CATALYTIC OXIDATION (YEAR 0- YEAR 1) / GRANULAR ACTIVATED CARBON (
YEAR 1- YEAR 30)
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
General	
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
Soil Vapor Extraction (SVE)	
SVE well installation	Cost associated with installation of SVE wells. Based on CDM experience.
SVE main system	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mnting, interconnecting piping and a manual motor start switch
SVE control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel piping	based on CDM experience
4" carbon steel piping	based on CDM experience
excavation for piping placement	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power requirements (40 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kW-hr
SVE treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
air/water separator tank	Based on CDM experience
catalytic oxidizer/thermal treatment	Based on vendor estimates
Catalytic Oxidation Unit	
Catalytic Oxidation Unit	Vendor estimate - Global Technologies, Inc. (May 2000)
Natural Gas	Vendor estimate - Global Technologies, Inc. (May 2000)
Sampling	Based on CDM experience
Granular Activated Carbon (GAC)	
Vapor Phase Carbon	Vendor estimate - Carbtrol (May 2000)
Regeneration	Vendor estimate - Carbtrol (May 2000)
Disposal	Vendor estimate - Carbtrol (May 2000)
Sampling	Vendor estimate - Carbtrol (May 2000)
Monitoring and Testing	
Test Kits/ Field Screening (per year)	Based on CDM experience and average test kit costs - ~25 samples per test kit; samples collected on a grid of 1 sample/250 cy contam. mat'l; 1 sampling grid per 2 weeks
Laboratory Analysis (VOCs, N, P) (per year)	Based on 1998 sample analysis costs from Midwest laboratories; samples collected on a grid of 1 sample/250cy contam. material; 1 sampling grid per month (including QA/QC samples)
shipping and handling (per year)	Costs associated with transporting samples from site to laboratory twice per month

TABLE 7-15
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT
ROCKFORD, ILLINOIS
FEASIBILITY STUDY

SOURCE AREA 11
ALTERNATIVE SCS-11C: SOIL VAPOR EXTRACTION (SVE) / GRANULAR ACTIVATED CARBON
COST SUMMARY

Item/Description	Total Cost
CAPITAL COSTS	
General	\$3,000
Soil Vapor Extraction (with emission controls)	\$242,000
Granular Activated Carbon	\$24,000
SUBTOTAL CONSTRUCTION COSTS ⁽¹⁾	\$269,000
Bid Contingency (10%)	\$27,000
Scope Contingency (10%)	\$27,000
Engineering and Design (15%)	\$40,000
Oversight/Health and Safety (5%)	\$13,000
TOTAL CAPITAL COSTS	\$376,000
ANNUAL OPERATING AND MAINTENANCE COSTS	
General	\$18,000
Regular System Maintenance/Electrical	\$36,000
Granular Activated Carbon Maintenance (Year 0- Year	\$268,100
Granular Activated Carbon Maintenance (Year 1- Year	\$50,002
Post Treatment Sampling	\$90,000
TOTAL ANNUAL COSTS	\$462,102
REPLACEMENT COSTS	
TOTAL REPLACEMENT COSTS ⁽²⁾	\$0
PRESENT WORTH ANALYSIS	
Total Capital Costs (from above) ⁽³⁾	\$376,000
Present Worth Annual O&M Costs ⁽⁴⁾	\$2,611,000
Present Worth Replacement Costs	\$0
TOTAL PRESENT WORTH	\$2,987,000

(1) Capital costs for construction items do not include oversight fees, which are accounted for separately.

(2) Replacement costs include construction and oversight capital costs.

(3) Capital costs represent the present worth of the given alternative.

(4) Present worth of annual O&M costs is based on a 7% discount rate over a life of 30 years.

SCS-11c (3) SVE present worth costs are based on 30 year operation.

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 11
ALTERNATIVE SCS-11C: SOIL VAPOR EXTRACTION (SVE) / GRANULAR ACTIVATED CARBON
DETAILED COST ESTIMATE

COST COMPONENT	Unit	No. Units	Unit Cost	Capital Cost	Construction/ Installation Costs	Annual O&M Costs	Start-up & Baseline Costs
Construction Costs				\$3,000	\$0	\$18,500	\$0
construction trailer (rental and delivery)	yr	1	\$3,300			\$3,300	
mobilization	ls	1	\$1,000	\$1,000			
demobilization	ls	1	\$1,000	\$1,000			
decon facilities	ea	1	\$1,000	\$1,000			
health and safety equipment	yr	1	\$9,000			\$9,000	
electrical power service supply	yr	1	\$3,600			\$3,600	
water supply	yr	1	\$2,400			\$2,400	
Equipment Costs				\$23,115	\$7,200	\$36,000	\$0
SVE well installation	ea	5	\$6,000		\$30,000		
SVE main system	unit	1	\$18,000	\$18,000	\$6,000	\$10,000	
SVE control panels	unit	1	\$3,000	\$3,000	\$1,500	\$500	
6" carbon steel piping	ft	535	\$57	\$30,495			
4" carbon steel piping	ft	100	\$32	\$3,200			
excavation for piping placement	ft	635	\$0.67		\$425		
electrical power requirements (25 HP)	ls	1	\$25,000			\$25,000	
SVE treatment building	sf	800	\$180	\$144,000	included		
air/water separator tank	ls	1	\$5,000	\$5,000		\$500	
Operating Costs				\$24,000	\$0	\$28,100	\$0
Vapor Phase Carbon	ea	2	\$12,000	\$24,000			
First Year Vapor Phase Carbon Regeneration	ea	20.00	\$12,000			\$240,000	
First Year Vapor Phase Carbon Disposal	lb	8040	\$3			\$20,100	
First Year Vapor Phase Carbon Sampling	ea	20.00	\$400			\$8,000	
Operating Costs				\$0	\$0	\$10,000	\$0
Regeneration	ea	4.00	\$12,000			\$48,000	
Disposal	lb	160.8	\$3			\$402	
Sampling	ea	4.00	\$400			\$1,600	
Operating Costs				\$0	\$0	\$5,500	\$0
Test Kits/ Field Screening (per year)	samples	33	\$300			\$9,900	
Laboratory Analysis (VOCs, N, P) (per year)	samples	390	\$200			\$78,000	
shipping and handling (per year)	shipmt	24	\$100			\$2,400	

(1) All Post Treatment Sampling costs are presented in costs per number of samples and shipments required per year - costs are presented as annual O&M costs

SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT - AREA 11
ALTERNATIVE SCS-11C: SOIL VAPOR EXTRACTION (SVE) / GRANULAR ACTIVATED CARBON
DETAILED COST ESTIMATE - COMMENTS

COST COMPONENT	COMMENTS
construction trailer (rental and delivery)	50'x12' construction trailer - \$1.65/mi delivery fee (100mi) - rental allowance per 1996 Means
mobilization	Heavy equipment and trailers, per vendor estimate
demobilization	Allowance for trailer and equipment demobilization
decon facilities	Based on level of personal and vehicle decontamination anticipated for this alternative
health and safety equipment	Allowance based on CDM equipment rates
electrical power service supply	Based on expected electrical costs per month for this alternative
water supply	Based on expected use per month for this alternative (e.g., decon, personnel use)
SVE well installation	Cost associated with installation of SVE wells. Based on CDM experience.
SVE main system	Vendor: includes blower, exp motor, inline air filter, silencers, dilution valve, moisture separator, condensate transfer pump, high condens. level alarm, vac. relief valve, vac. gauges, skid mnting, interconnecting piping and a manual motor start switch
SVE control panels	Vendor estimate - NEEP (May 1998)
6" carbon steel piping	based on CDM experience
4" carbon steel piping	based on CDM experience
excavation for piping placement	12" wide trench and backfill, 36" deep as per 1996 Means
electrical power requirements (40 HP)	Based on 3-phase power, working 24 hrs/day, \$0.09/kWh-hr
SVE treatment building	Basic prefabricated building on concrete pad. Based on CDM experience.
air/water separator tank	Based on CDM experience
catalytic oxidizer/thermal treatment	Based on vendor estimates
Vapor Phase Carbon	Vendor estimate - Carbtrol (May 2000)
First Year Vapor Phase Carbon Regeneration	Vendor estimate - Carbtrol (May 2000)
First Year Vapor Phase Carbon Disposal	Vendor estimate - Carbtrol (May 2000)
First Year Vapor Phase Carbon Sampling	Vendor estimate - Carbtrol (May 2000)
Regeneration	Vendor estimate - Carbtrol (May 2000)
Disposal	Vendor estimate - Carbtrol (May 2000)
Sampling	Vendor estimate - Carbtrol (May 2000)
Test Kits/ Field Screening (per year)	Based on CDM experience and average test kit costs - ~25 samples per test kit; samples collected on a grid of 1 sample/250 cy contam. matl; 1 sampling grid per 2 weeks
Laboratory Analysis (VOCs, N, P) (per year)	Based on 1998 sample analysis costs from Midwest laboratories; samples collected on a grid of 1 sample/250cy contam. material; 1 sampling grid per month (including QA/QC samples)
shipping and handling (per year)	Costs associated with transporting samples from site to laboratory twice per month